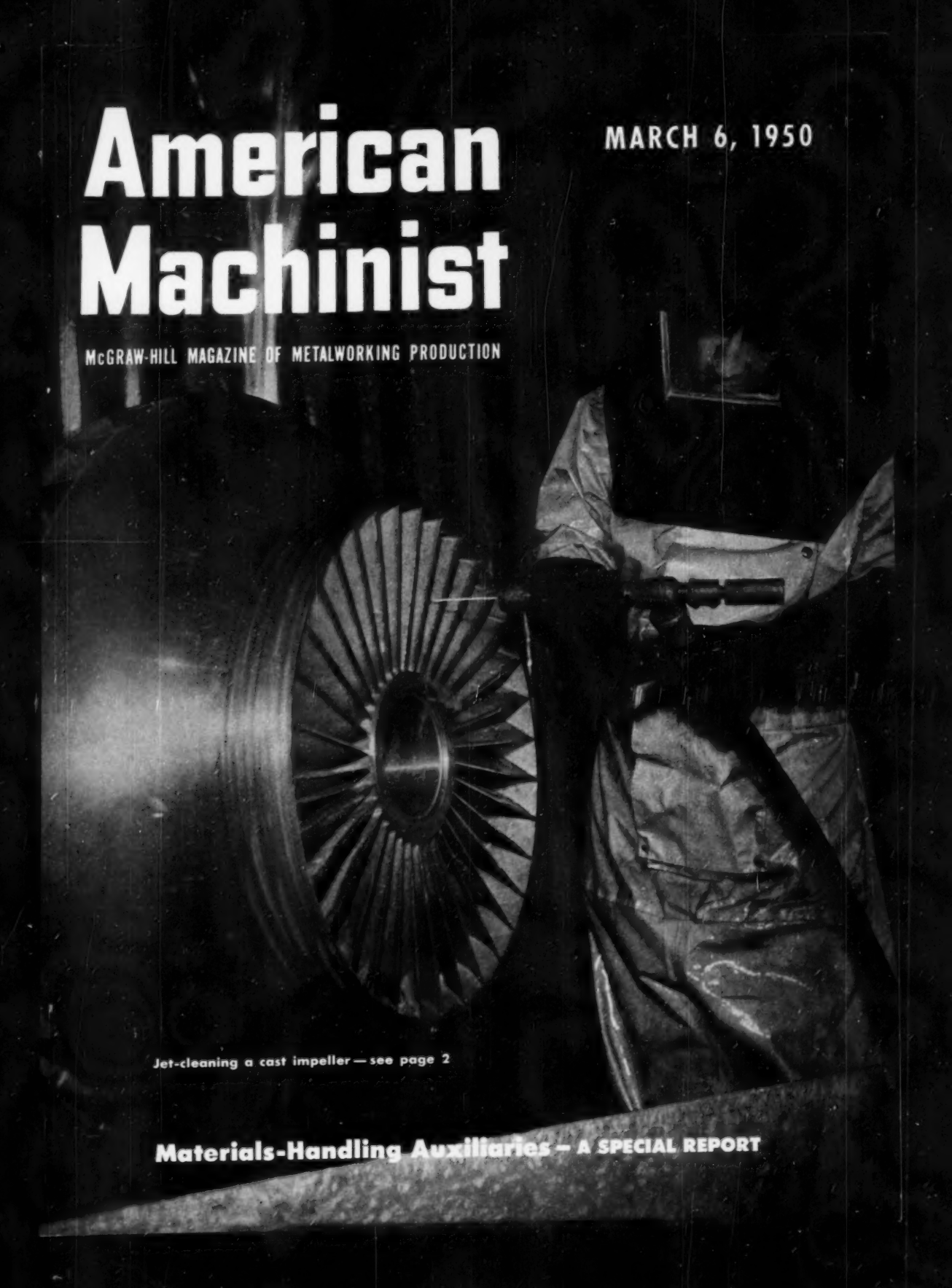
American Machinist

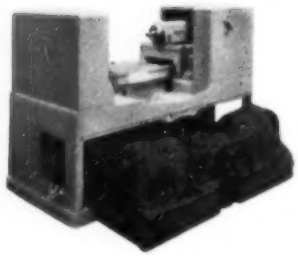
MARCH 6, 1950

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Jet-cleaning a cast impeller—see page 2

Materials-Handling Auxiliaries—A SPECIAL REPORT



The pump, tank, and motor unit, as shown above, is separate from the machine base, and can be easily drawn out for inspection and servicing. With the entire assembly out in the open, all parts are easy to get at — easy to keep clean.

The separate power unit offers still another important advantage, too. It isolates motor vibration from the machine, for maximum precision and better finish.

easy to get at

Roll-out power units save service inspection time and expense on new Heald Bore-Matics

You know how important it is to have a machine that will cut down-time to the minimum. And that's exactly what you get in all Heald precision finishing machines. For Heald has attacked the service inspection problem from two angles. First, by building into every machine the inherent quality that means longer service with minimum attention. And second, by making all parts easily accessible. The result — less time out for servicing, more production time on the job.

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Clips and Quips

Mighty Little Squirt . . . For our cover picture, a 35-in., high-speed, shrouded aircraft impeller, cast in one piece by a new plaster-mold process, undergoes one of its final production steps at the Eclipse-Pioneer Division of Bendix Aviation Corporation, Teterboro, N. J. The worker, inside a rubber suit and with his head protected by a special helmet, is using a needle-like 300-psi water jet to break up plaster and force it from inner sections. This new process, the result of six years of research, makes possible a one-piece casting of intricate cylindrical shape, with tolerances as small as plus or minus 0.005 in. and surface finish of 30 rms.

The photograph was taken by Pete Carey of the company.

Whingdings . . . When we were serving our apprenticeship, the boss called the attachments we made to standard devices "whingdings." Often they made all the difference between a fair die or machine and a good one. Well, Associate Editor Mike Rowan has been prying into corners to find "whingdings" that convert fork trucks into handling tools for odd-shaped or peculiarly weighted shop loads. If you want to take the dollars out of handling costs, curl up by the fire and study this one.

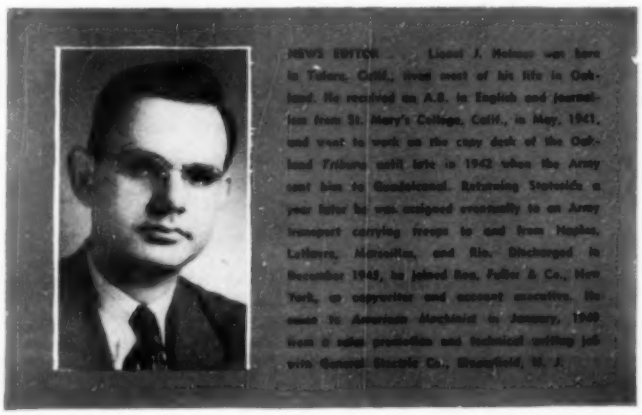
Are We "Chicken"? . . . To finish off December, we published a story summarizing our recent researches in the no man's land of high-speed machining. See "Are Shop Men Scared of High-Speed Machining?" . . . Then follow up by reading Ben Brosheer's report on a 3-company campaign to speed hobbing of steel gears and the results to date.

Speak Gently . . . How does one correct a worker, in this age of emancipation, without stirring up a hornet's nest? Edmund Mottershead has put together a set of instructions guaranteed to get results without knocking the pins out from under shop morale . . . And then we've put together the very positive opinions of four old shopmen about the question "Where Are the Toolmakers?"

Presto Tooling . . . Dies continue to be one of your major interests—so we continue to serve it. We have two die articles in this issue, one on 2-station dies by J. R. Paquin, and a short on a stepped die . . . And to simplify your grinding setups, we have 8 sketches and more photos to illustrate basic principles and smart ways to cut fixture cost in production surface grinding.

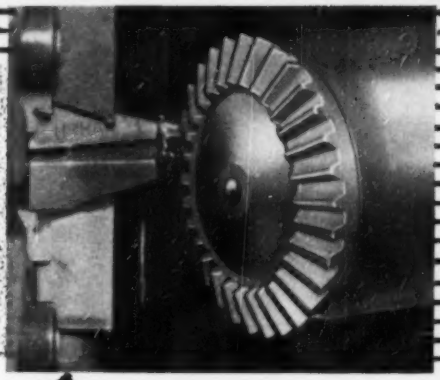
Assembly . . . Much of the dollar-saving thinking in fabrication is done for you by the equipment maker . . . But any assembly savings you make will usually be the result of your own ingenuity. To make your task easier, we bring you smart, and broadly applicable, assembly ideas. In this issue are two: First, we explain in detail how Allis-Chalmers assembles a series of small blades for riveting into a turbine rotor. The stunt here is low-melting-point Wood's metal as a meltable clamp . . . Then we bring you the grandpa of shrink fits—on a liner 27x102 in. The engineers out at Sunnyvale, Calif., plant of Westinghouse did some tall thinking first. So, we give you the outline.

Coming . . . March 20 *AM* will include the second of our series of three Special Reports dealing with gears by Charles Pfeffer. This 12-page one describes equipment and methods for gear finishing. As printing presses are made to take 15 pages rather than 12, we finish the form with a 4-page discussion of 3-point support and its importance in designing machine tools. Our lead article explains in pictures how C. F. Braun Co., on the West Coast, fabricates big tanks and pressure vessels, including some very advanced X-ray units. There are also articles on mechanized finishing, on tricks in die casting at A C Spark Plug, and GE practice in carbide tooling for automatic screw machines. We have also another group of Shop Shots, the concluding instalment of Otto Held's series on multiple-slide machines, and our usual departments. Our cover will picture a big cone grinder at Timken.

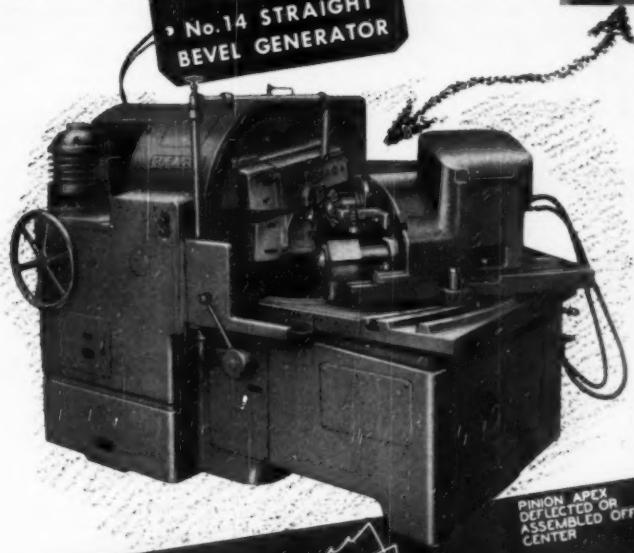


NEWS EDITOR . . . Lionel J. Hobson was born in Tulare, Calif., [illegible] east of his life in Oakland. He received an A.B. in English and Journalism from St. Mary's College, Calif., in May, 1941, and went to work on the copy desk of the Oakland *Tribune* until late in 1942 when the Army sent him to Guadalcanal. Returning Stateside a year later he was assigned eventually to an Army transport carrying troops to and from Naples, Leghorn, Marseilles, and Rio. Discharged in December 1945, he joined Ross, Fuller & Co., New York, as copywriter and account executive. He came to *American Machinist* in January, 1949, from a sales promotion and technical writing job with General Electric Co., Bloomfield, N. J.

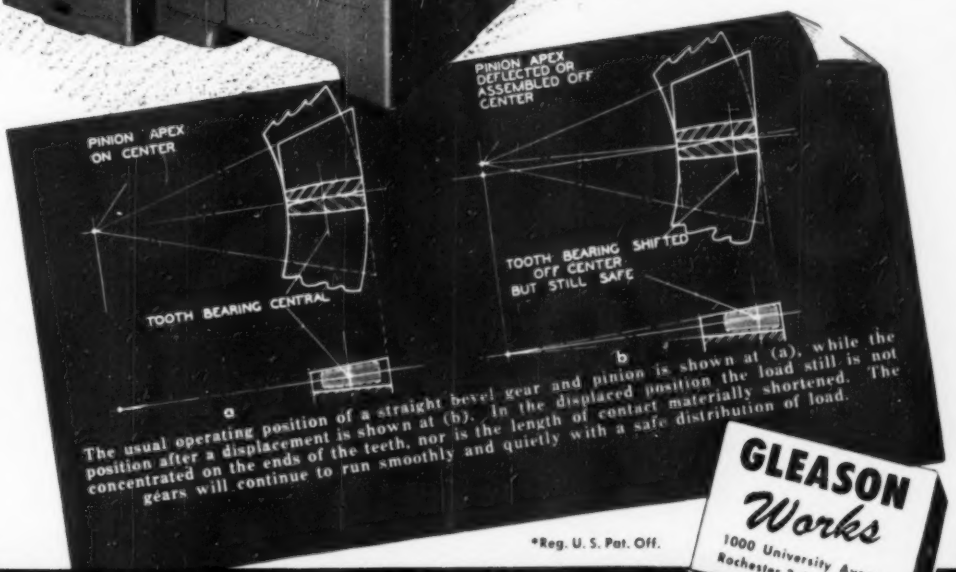
DESIGNED *Especially* FOR CONIFLEX GEAR PRODUCTION



GLEASON
No. 14 STRAIGHT
BEVEL GENERATOR



Coniflex* gears, in the medium sizes, are produced on the Gleason No. 14 Straight Bevel Generator. Completely universal, this machine roughs and finishes Coniflex gears with equal versatility. The Gleason No. 14 Straight Bevel Generator is easier to operate and requires less cutting time than previous models for comparative gears. It also produces a localization of tooth bearing which makes Coniflex the smoother operating, easier assemblying gears with wider operating tolerances. Today, Coniflex gears have proven themselves superior to ordinary straight bevels. In saved assembly time, in superior operation, Coniflex gears are providing daily outstanding performance.


PINION APEX ON CENTER
TOOTH BEARING CENTRAL
a
PINION APEX DEFLECTED OR ASSEMBLED OFF CENTER
TOOTH BEARING SHIFTED OFF CENTER BUT STILL SAFE
b

The usual operating position of a straight bevel gear and pinion is shown at (a), while the position after a displacement is shown at (b). In the displaced position the load still is not concentrated on the ends of the teeth, nor is the length of contact materially shortened. The gears will continue to run smoothly and quietly with a safe distribution of load.

*Reg. U. S. Pat. Off.

GLEASON *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

You'll like these

FAMILY FEATURES

OF THRIFTY CINCINNATI MILLERS

Thrift is a family characteristic of CINCINNATI knee-type milling machines. They have many features that save you money year after year. The five illustrated here are common to all CINCINNATI ML, MI, Dial Type, High Power and Dual Power Dial Types. They constitute five reasons why it pays to equip your shop with Cincinnatis. Write for catalogs and then compare feature for feature with any other machine. For the long pull, you'll save with Cincinnati.

Cincinnati vertical screws never get stubborn and balky; they never squeal from the heat of heavy work. That's because they're **automatically lubricated from an individual reservoir** which you can fill with EP oil.

New men need no memory training course to operate a Cincinnati. As the lever is moved, so goes the feed motion; technically, it's **independent directional control.**

Soothing syrup to fretful cutting. Dynapoise overarms dampen out chatter; pay off in higher feed rates for many setups.

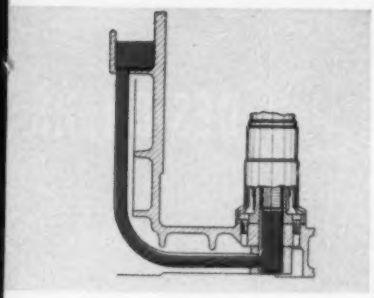
Hydraulic power does the work of shifting spindle speed gears . . . without effort, you can change spindle speeds as often as the job requires. Except in the "M" models, feed gears are also shifted by power.

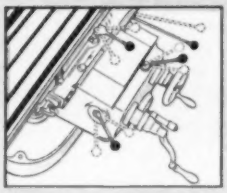
The villain of down-milling, backlash in the table feed screw is automatically eliminated.* The unit is built in. Principle of operation is indicated in the drawings at the right. Two nuts are employed, which tend to rotate in opposite directions when down-milling (drawing A), firmly seating against opposite sides of the feed screw, points W and X. **No backlash.** Up-milling indicated by drawing B.

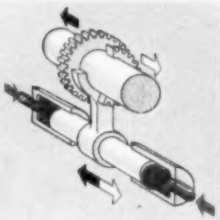
*Standard equipment, High Power and Dual Power Dial Types. Extra cost for other machines.

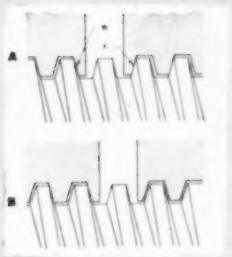
THE CINCINNATI

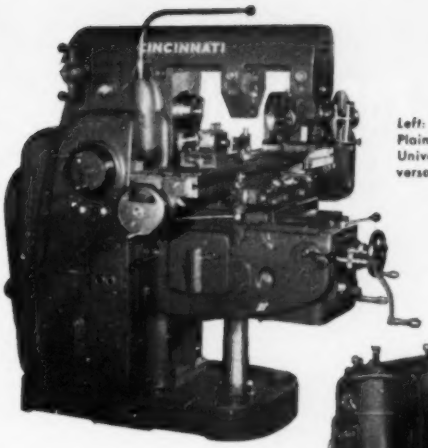
MILLING MACHINES • BROACHING
FLAME HARDENING MACHINES • OPTICAL



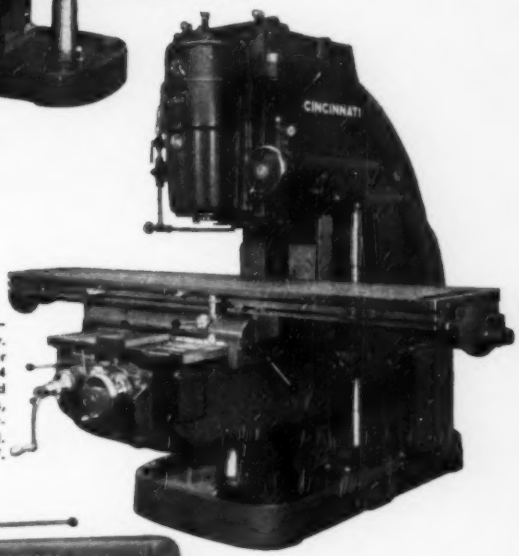








Left: 3 and 5 hp sizes, No. 2ML Plain and Universal, No. 2MI Plain, Universal and Vertical. No. 2MI Universal illustrated. Catalog M-1662-1.



Right: The powerful group—up to 50 hp for the big boy. High Power and Dual Power Dial Types; Nos. 3 and 4 sizes, Plain, Universal and Vertical; Nos. 5 and 6 sizes, Plain and Vertical. No. 5 Vertical Dual Power illustrated. Catalogs M-1644 and M-1647.

Left: Intermediate power. Nos. 2, 3 and 4 Dial Types; medium speed and high speed; Plain, Universal, Vertical. No. 2 Plain Dial Type illustrated. Catalog M-1623-1.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

MACHINES • CUTTER SHARPENING MACHINES
PROJECTION PROFILE GRINDERS • CUTTING FLUID

FOR ENGINEERS,

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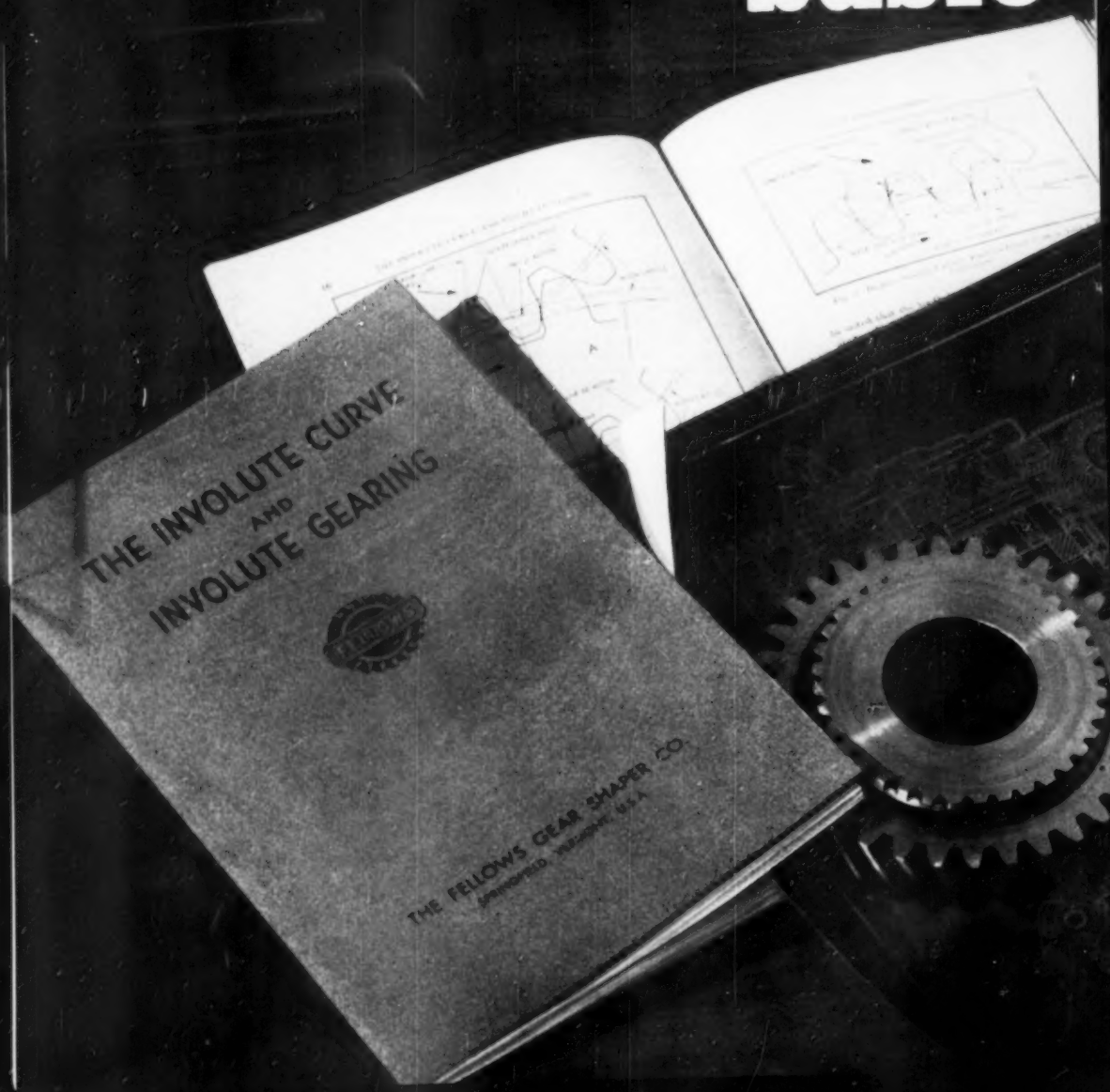

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reference

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It's Yours for the Asking... this new and expanded edition. The Involute Curve and Involute Gearing contains a fund of information applicable to precision gearing in industry; it answers questions, solves gear design problems, will be constantly in use. It is made available in the spirit of Fellows 50-year consulting engineering service to industry.

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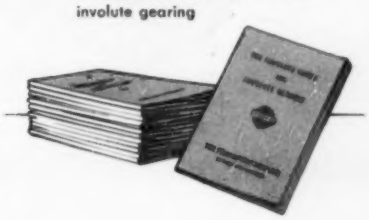

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GEAR SHAPERS • SHAVING MACHINES
THREAD GENERATORS • CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS • PLASTICS MOLDING MACHINES

VAN NORMAN

Reduce Idle Machine Time...

There's A Size To Meet Your Exact Requirements

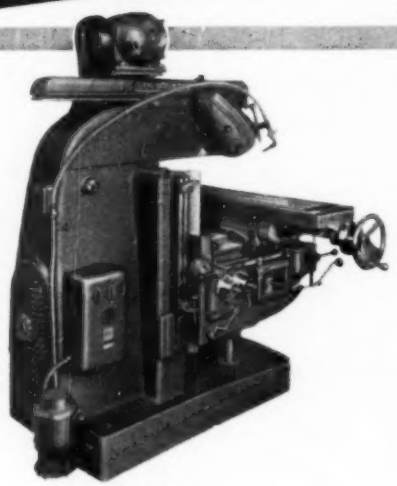
Manufacturers in all types of industries step up milling production, minimize errors and cut costs per man and machine-hour with Van Norman Ram Type Millers.

These versatile millers enable you to perform any and every milling job from horizontal to vertical . . . simply by positioning the adjustable cutterhead. This means *one* machine gives you the work range of several types of single purpose millers.

In addition, Van Norman Ram Type Millers save time because most jobs can be carried through to completion without changing the work set-up.

See for yourself how these machines cut costs, improve accuracy and increase production in the tool room, machine shop, laboratory and pattern shop. Their adaptability makes them ideal for maintenance and repair work. They are available in a wide range of sizes . . . for every milling requirement. Write for information.

Model No. 22L
Table size: 45" x 10"

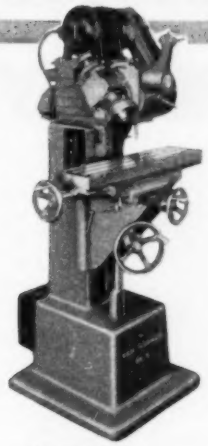


Model No. 26
Table size: 58" x 13"

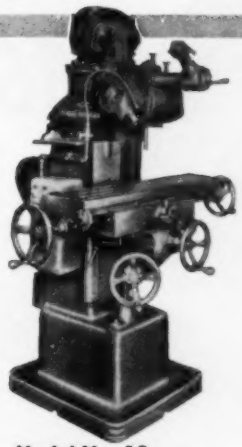
VAN NORMAN COMPANY

Ram Type Millers

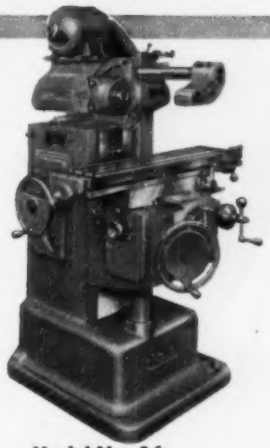
Cut Costs on All Types of Milling



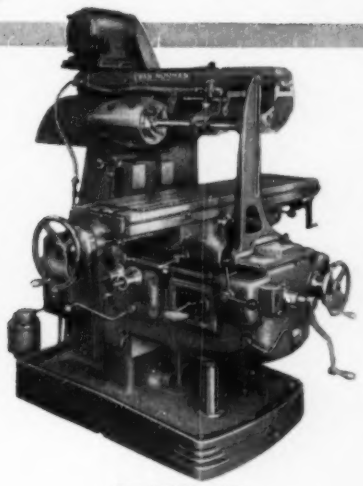
Model No. 6
Table size: 30" x 6⅞"



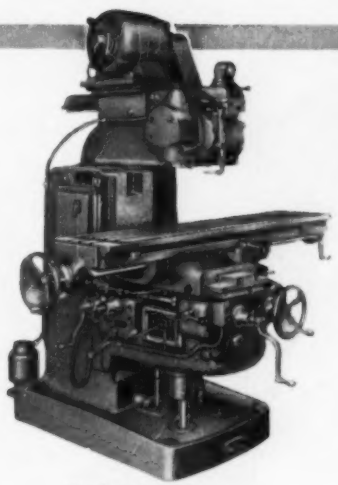
Model No. 12
Table size: 37½" x 9⅜"



Model No. 16
Table size: 37" x 9½"



Model No. 36
Table size: 64" x 14"



Model No. 38
Table size: 64" x 14"

SPRINGFIELD 7, MASSACHUSETTS

PIPE NIPP

450 pieces
3600 pieces

WORLD'S LARGEST MANUFACTURER OF ALL TYPES

LES

per hour per chaser grind

Such production is proof of "high production and low cost"—yet thread tolerances are held to specifications. These figures are production results of a manufacturer producing steel pipe nipples, using LANDMACO machines equipped with air-operated carriage fronts. Different conditions might make an even higher output possible.

LANDMACO Pipe and Nipple Threading Machines thread, ream, and chamfer in one operation. Built in 1¼" and 2" single- and double-head models, these machines are equipped with either internal or external trip heads.

Write for Bulletin D-84

LANDIS MACHINE COMPANY
ENGINEERING DATA
Name of Part 3/4" x 2 1/2" Pipe Nipple
Material Galv Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 33 Ft. P.M.
Pieces per Hour 450
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3600

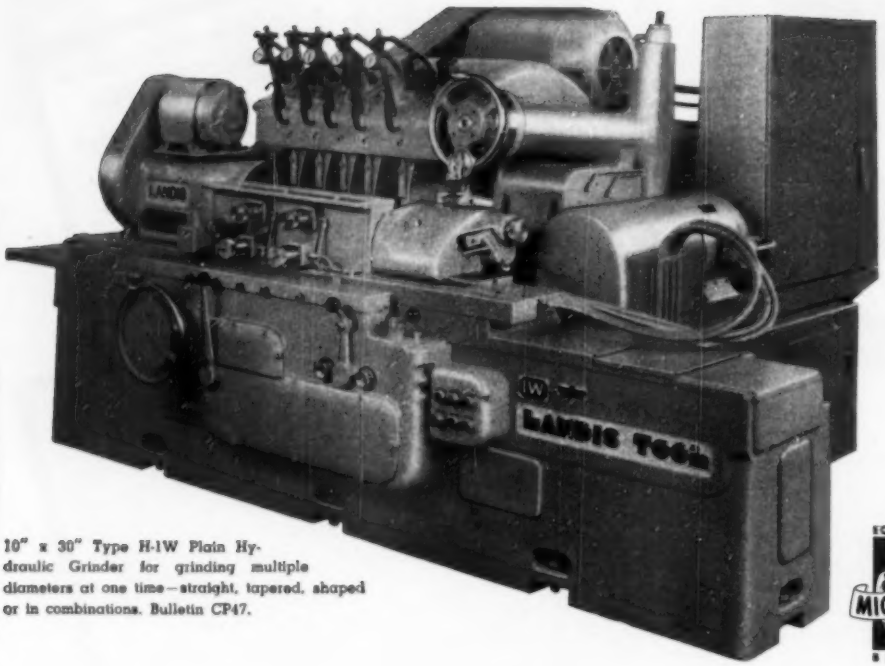
ENGINEERING DATA
Name of Part 3/4" x 10" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 38.3 Ft. P.M.
Pieces per Hour 400
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3400

ENGINEERING DATA
Name of Part 2" x 6" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1 1/16"
Cutting Speed 42.8 Ft. P.M.
Pieces per Hour 200
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 1800

ENGINEERING DATA
Name of Part 1 1/2" x 5" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 35.8 Ft. P.M.
Pieces per Hour 232
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 2000

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

OF THREADING EQUIPMENT

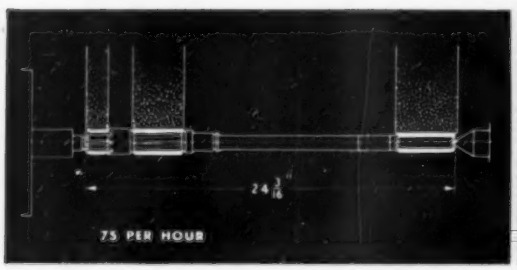


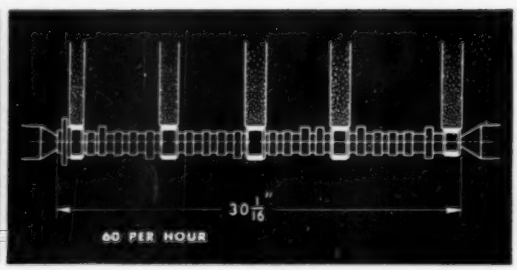
10" x 30" Type H-1W Plain Hydraulic Grinder for grinding multiple diameters at one time—straight, tapered, shaped or in combinations. Bulletin CP47.

EQUIPPED WITH MICROSPHERE BEARINGS

New Multiple Wheel Grinder Gives Big Reductions

- Cuts unit costs
- Increases production





LANDIS TOOL
Precision Grinders

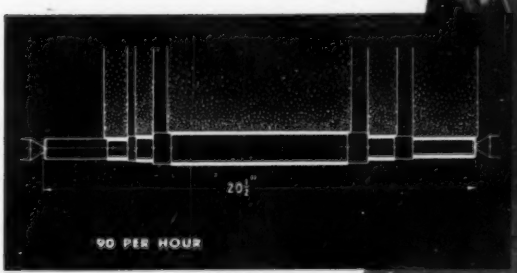
Our engineers will be glad to make production estimates and tooling suggestions on the basis of your blue prints.

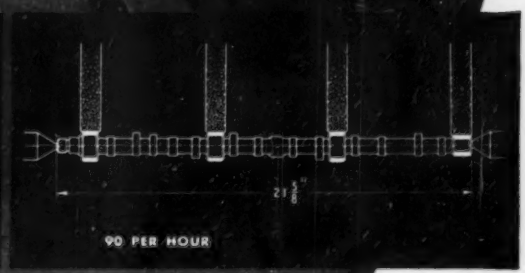
high production features

PRESSURE LUBRICATED MICROSPHERE
WHEEL SPINDLE BEARINGS
TAMPER-PROOF FEED and TRAVERSE
ADJUSTMENTS
HYDRAULIC GRINDING WHEEL FEED
Hydraulic rapid infeed
Hydraulic slow grinding feed
AUTOMATIC HYDRAULIC BACKRESTS
TWO-SPEED HYDRAULIC WHEEL DRESSING
Automatic Rapid traverse
between wheels
PROFILE BARS FOR WHEEL DRESSING

in Grinding Costs

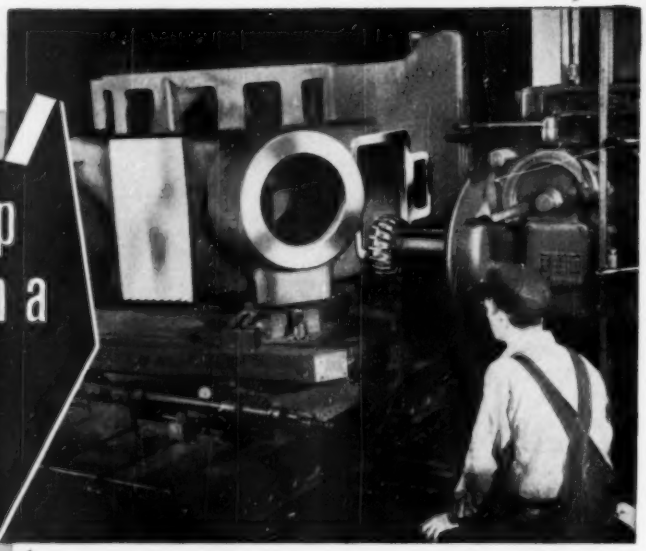
5 different diameters and flange face — ground at the same time by infeed grinding with 5 different wheels on the same spindle.





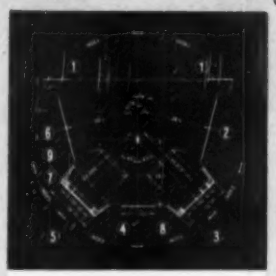
LANDIS TOOL COMPANY / 12 C. SIXTH STREET / WAYNESBORO, PA.

Large compressor crankcase placed on a rotary table to speed overall machining time on a G. & L. machine.



Quick Set-Up of this Part on a G&L

MAKES THIS JOB PROFITABLE



Outline drawing of compressor crankcase showing different index stations. Heavy lines indicate finish surfaces.

Machine Equipped With Rotary Table Simplifies Difficult Work Handling . . . Indexing Presents All Surfaces for Precision Machining

Only one work setting is required to machine six different surfaces of this large casting. Use of a hand operated rotary table on a Giddings & Lewis machine makes it possible to index the work without unclamping, relocating and reclamping for each operation. This procedure increases overall machining accuracy and profitably cuts handling time.

After the initial setup is made on this part, each subsequent casting is placed on the rotary table and is ready for machining in approximately 15 to 20 minutes. Overall machining time varies from 6½ to 7 hours depending upon the condition of the casting.

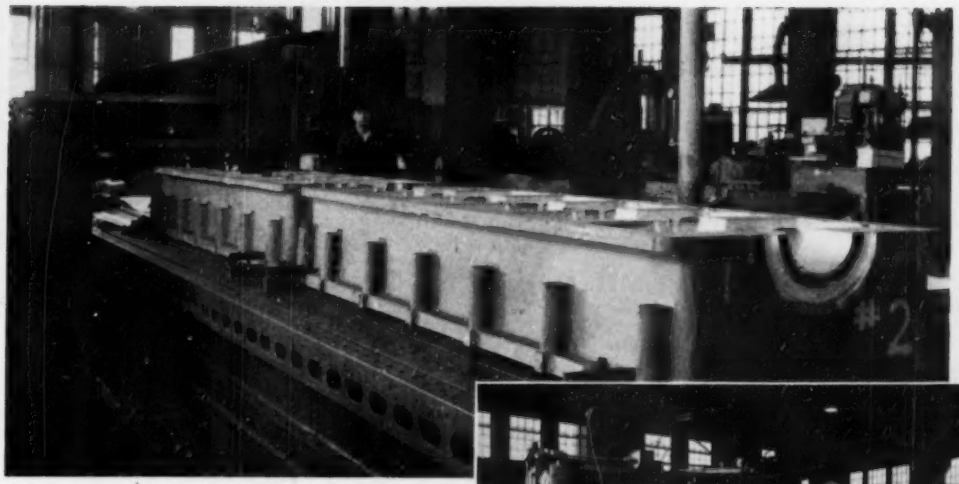
Similar speed-ups in handling your own work may be easily effected by using time-saving accessories and attachments on your Giddings & Lewis horizontal boring, drilling and milling machine. Ask G. & L. engineers.

SEQUENCE OF MACHINING OPERATIONS

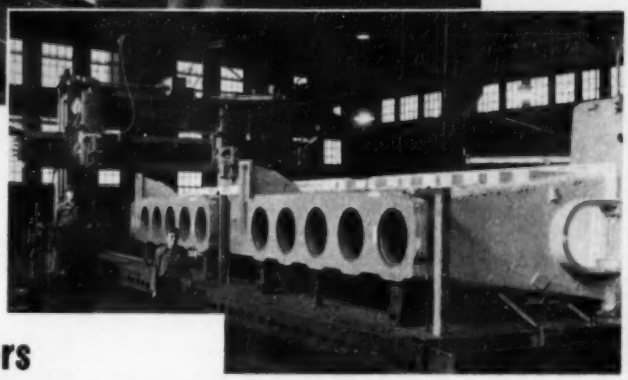
1. **Mill** base—**Index Rotary Table.**
2. **Mill** first flange for cover plate opening—**Index Rotary Table.**
3. **Mill** first 19" cylinder connecting surface—**Index Rotary Table.**
4. **Mill** 12¾" pad—**Index Rotary Table.**
5. **Mill** second 19" cylinder connecting surface—**Index Rotary Table.**
6. **Mill** second flange for cover plate opening—**Index Rotary Table.**
7. **Bore,** rough and semi-finish second 12.750" cylinder opening—**Index Rotary Table.**
8. **Bore,** rough, semi-finish, finish and chamfer first 12.750" cylinder opening—**Index Rotary Table.**
9. **Bore,** finish and chamfer second 12.750" cylinder opening.

Giddings & Lewis Handbook "Horizontal Boring, Drilling, and Milling Machines and Their Application." 266 Pages of valuable information. Price $5.00.

GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.



Cincinnati Openside Planer with auxiliary housing and special head makes it possible to plane bearing pockets or seats.



Three heads operate simultaneously to plane top, side, and bottom of these two diesel crankcase frames.

Cincinnati HYPRO Planers *Easily Meet* Production Requirements of Large Diesel Engine Manufacturers

1 Openside Planer Machines 14 Circular Bearing Pockets in 2 Base Plates Holding Dimensions to ± .001"

Progressive diesel engine manufacturers are finding that on large engine castings numerous precision machining operations can be handled better and faster with Cincinnati HYPRO Planers. Two typical jobs graphically show how Cincinnati Openside and Double Housing Planers simplify metal removal.

Example No. 1 illustrates how two base plates are mounted on the Openside Planer table. With a specially designed head on the rail, bearing pockets are planed and held within ± .001" round. In addition, these bearing seats are parallel with each other. After they are completed, and without changing the part setup, the flanged top of the base plate is planed. This machining method assures over all flatness of the planed surface and makes all subsequent fitting operations comparatively simple.

2 Double Housing Planer Machines 3 Sides of Crankcase Simultaneously Maintaining Overall Parallelism and Flatness

Example No. 2 shows how a Double Housing Planer is used to machine *three* sides of the engine crankcase frame in a single setup. Side heads are used on both machine columns, and one head is used on the cross rail. Precision relationships and parallelism between all finished surfaces are maintained when performing planing operations in this manner.

If you have large castings, weldments, or fabricated parts requiring precision fits, you will be astonished with the time-saving advantages offered by Cincinnati HYPRO Planing methods. Write, phone, or wire The Cincinnati Planer Company for immediate, experienced engineering help regarding your problem.

Ask the Experienced Engineers of Cincinnati Planer Company for their recommendations in solving your problems without obligation.

THE CINCINNATI PLANER COMPANY

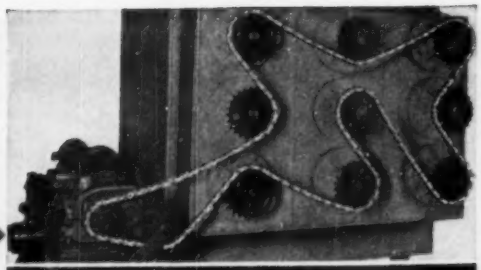
(SUBSIDIARY OF GIDDINGS AND LEWIS MACHINE TOOL COMPANY)

CINCINNATI 9, OHIO, U. S. A.

HYPRO

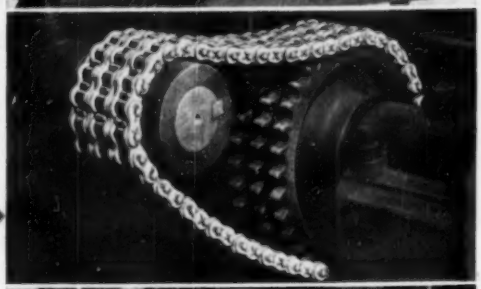
FLEXIBLE!

Link-Belt Precision Steel Roller Chain is flexible; a series of linked rollers that form a flowing highway of power.



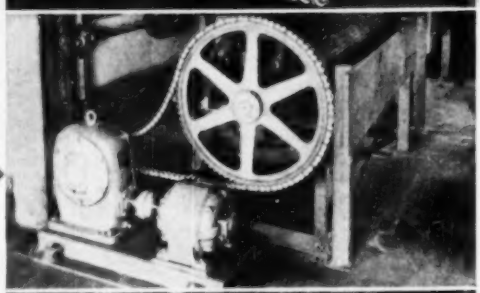
POWERFUL!

Link-Belt Precision Steel Roller Chain can be applied to small fractional horsepower machines or to units involving more than a thousand horsepower.



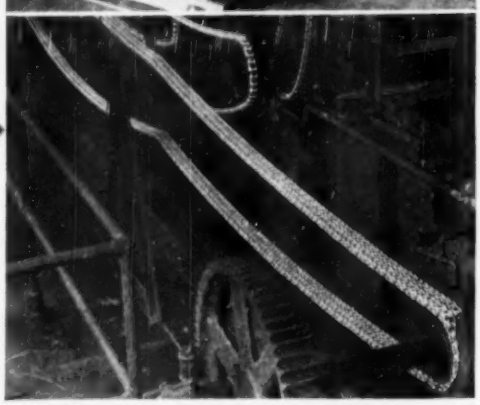
SHORT CENTERS!

Link-Belt Precision Steel Roller Chain can be used on short centers at high ratios. Adapted to withstand heavy starting loads and severe shock.



LONG CENTERS!

Link-Belt Precision Steel Roller Chain is adapted to coordinate motion of widely separated shafts, affording positive operations.



RELIABLE!

Made by Link-Belt—your guarantee of superior construction and proper design. Ask for Data Book No. 1957-A.

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11.4750

LINK-BELT

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ROLLER CHAINS & SPROCKETS

Put it on the BLANCHARD

. . . for stock removal

These side plates, approximately 9″ x 18″, are ground from the rough on a No. 18 Blanchard with 36″ chuck — requiring 1/16″ to 1/8″ stock removal per side.

. . . for close tolerance

These plates are held flat within .003″, parallel to .001″, and to a dimension tolerance of ±.001″. A Blanchard 20C50 Cylindrical Wheel is used.

. . . for speed

Three chuck loads of 5 pieces each, give a production of 30 surfaces per hour. Feed is .020″ per min.

. . . for comparison

A comparison of the Blanchard Method with your present methods may be a pleasant surprise. May we grind some samples for you?

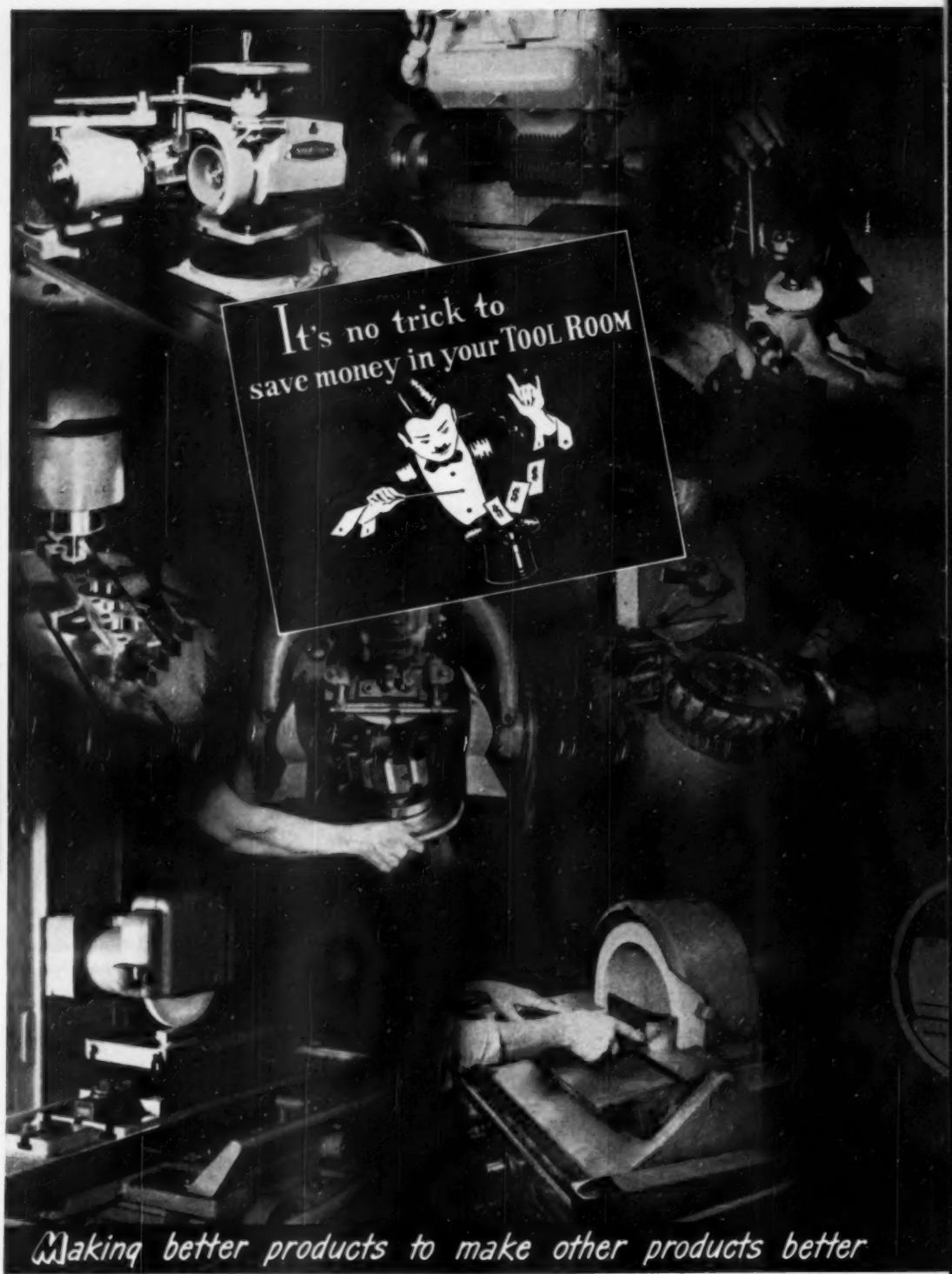
V-348

NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.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save money in your TOOL ROOM
Making better products to make other products better

You'll Find It Really Easy with 32 ALUNDUM Grinding Wheels

And Here's Why . . .

4 to 6 Times Faster Cutting

In plant after plant they are finding that the extra sharpness of 32 ALUNDUM wheels and their greater number of cutting points enable them to remove stock from high speed steel and cast alloy tools at rates from four to six times faster per pass than with other abrasives. That means a big saving in tool grinding costs.

Less Dressing

And "32" wheels stay sharp longer. That's because there are more cutting points doing the work and points that don't dull quickly because they are over 99% pure fused alumina. You can go all the way around even a large multi-tooth cutter without having to stop and dress a 32 ALUNDUM wheel. This is another big cost saver.

Less Tool Spoilage

"32" wheels cut so cool that there's far less spoilage of heat-sensitive high speed steels—even with inexperienced operators. That's because grinding heat is spread over more cutting points and points that are sharper, that penetrate high speed steels more easily.

There's Also "38" and "57"

Some of your tool grinding jobs may be such that "32" is not the recommended abrasive but you can be sure that there is a Norton abrasive with just the right characteristics to give you maximum economy. It may be 38 ALUNDUM abrasive, the original white abrasive and a tool room favorite for 40 years. Or it may be 57 ALUNDUM abrasive which combines a fast cutting action with great toughness and thus is widely used for off-hand tool grinding operations. And these are still further supplemented by regular ALUNDUM wheels and 19 ALUNDUM wheels.

Let a Norton abrasive engineer or your Norton distributor show you that it's no trick to save money in your tool room when you use the right Norton wheels for each job. And send for "A Handbook on TOOL ROOM GRINDING"—162 pages of practical information. Just write for Form 835-C-3.

W-1285

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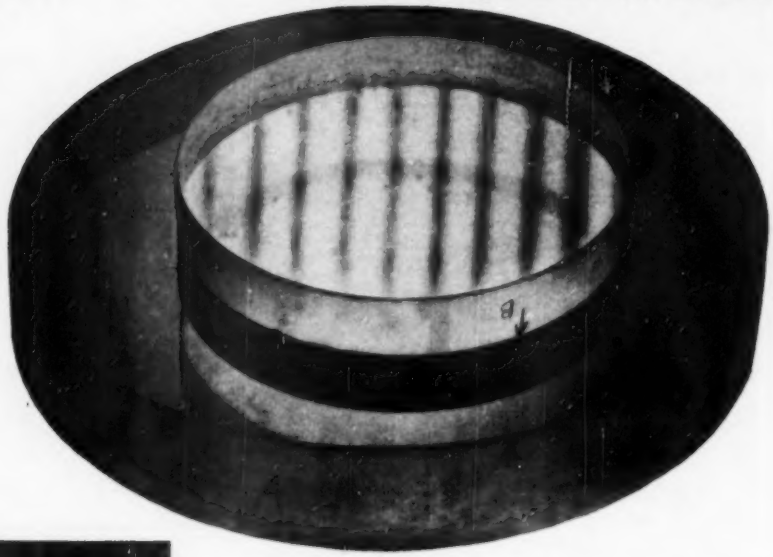
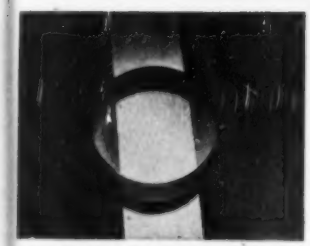
Van Keuren OPTICAL FLATS
are the proof of Precision

BOSTON ◉——



——◉ NEW YORK



Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

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THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

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31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbaloy Plug Gages • Carbaloy Measuring Wires

Yesterday
76
MINUTES

Today
34
MINUTES

"AMERICAN"
HYDRAULIC DUPLICATOR

The Latest COST CUTTING Sensation

Here's a job that's being done in 34 minutes, floor to floor. This includes a finishing cut to reduce grinding time to a minimum. It formerly took 76 minutes to turn and 50% longer to grind.

This marvelous machine will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods and axles. It will also accommodate a wide variety of chuck work having irregular contours.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" on shaft work is confined to the first diameter only after which all other diameters are secured automatically.

This machine may be quickly converted to standard lathe operations.

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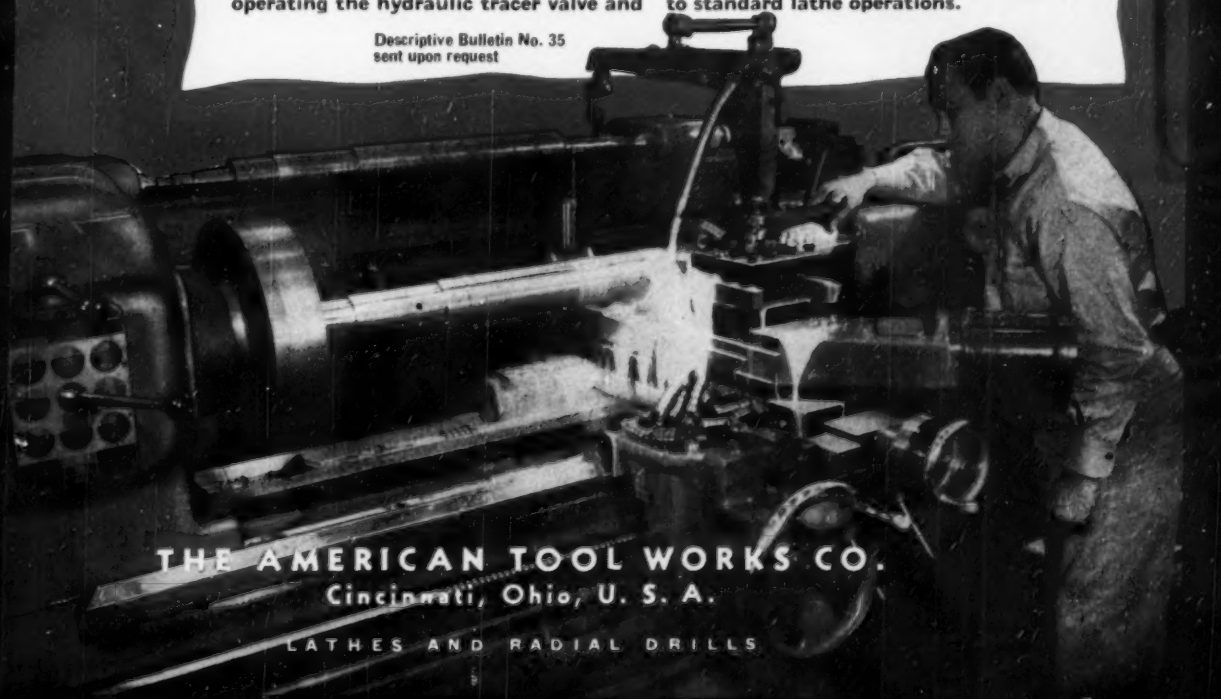
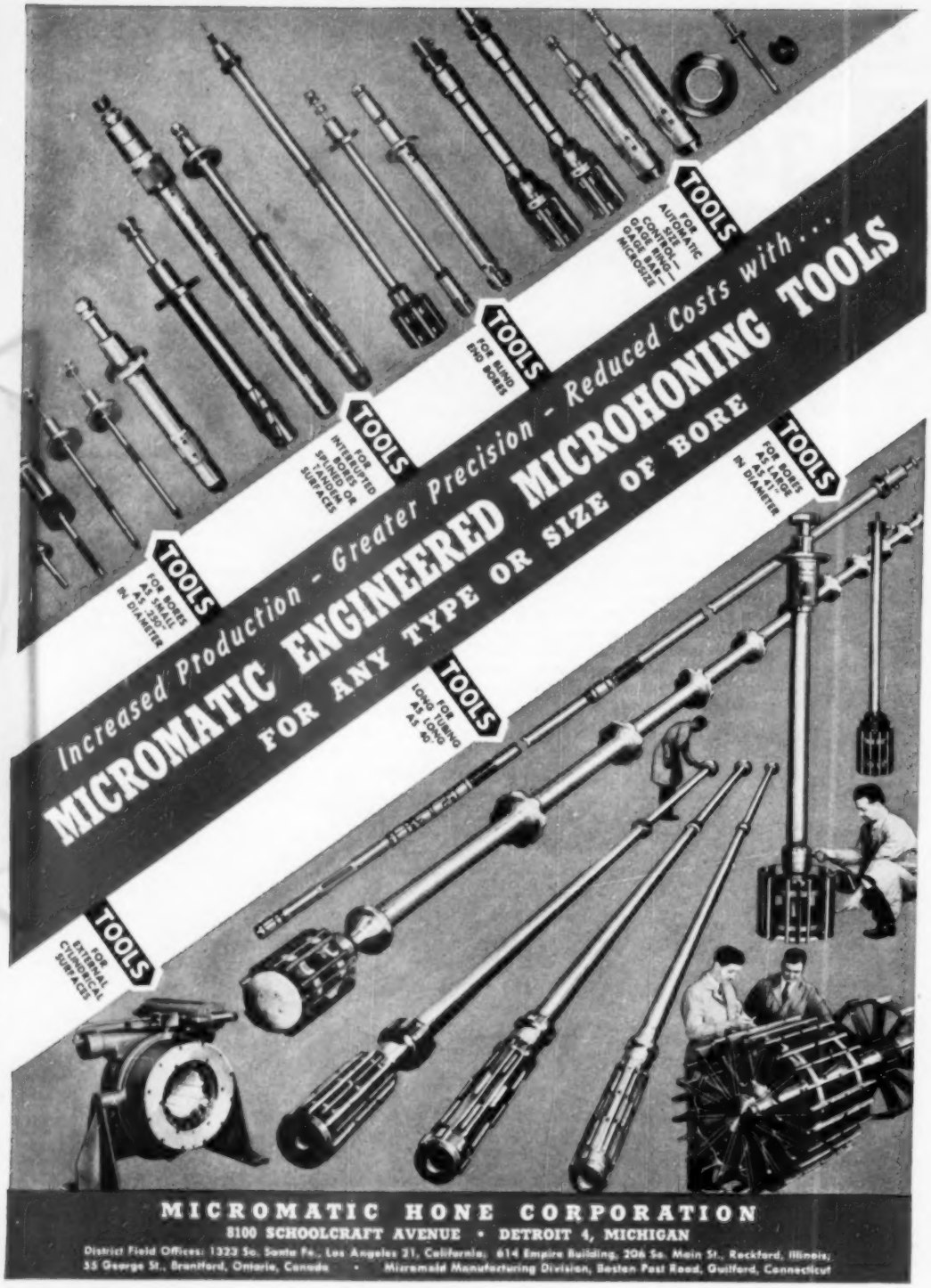


THE AMERICAN TOOL WORKS CO.
Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS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FOR BLIND END BORES
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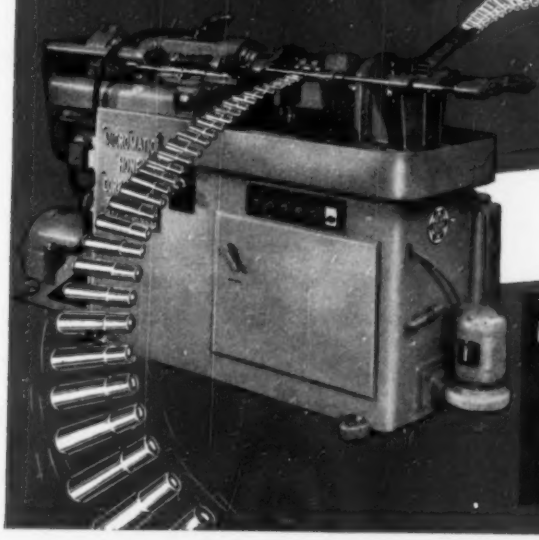
Automatic production over 400 gears per hour.



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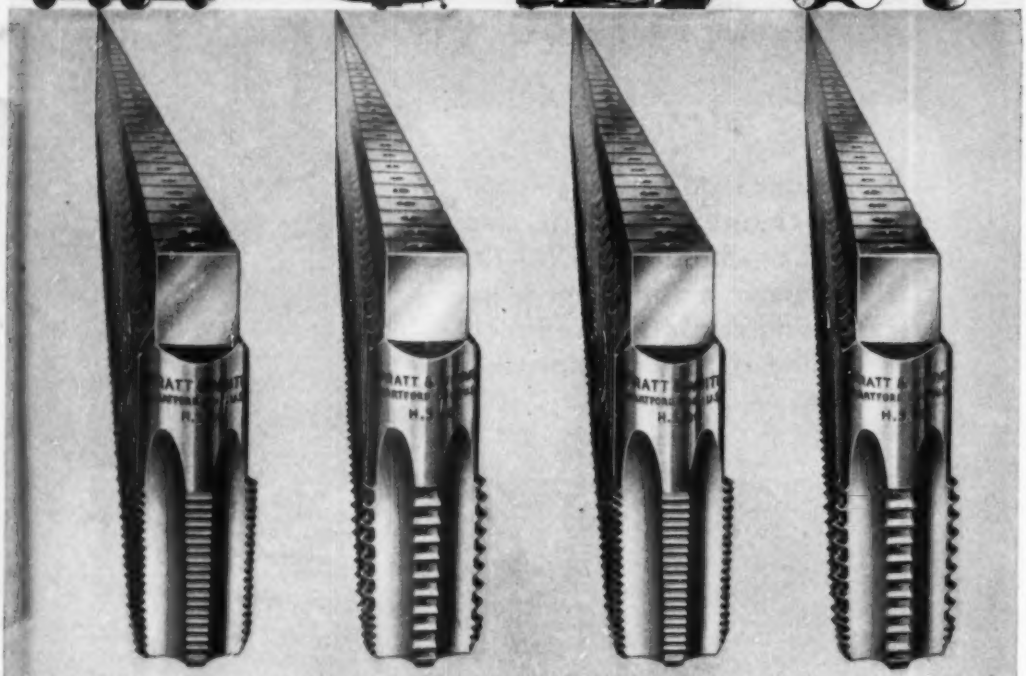

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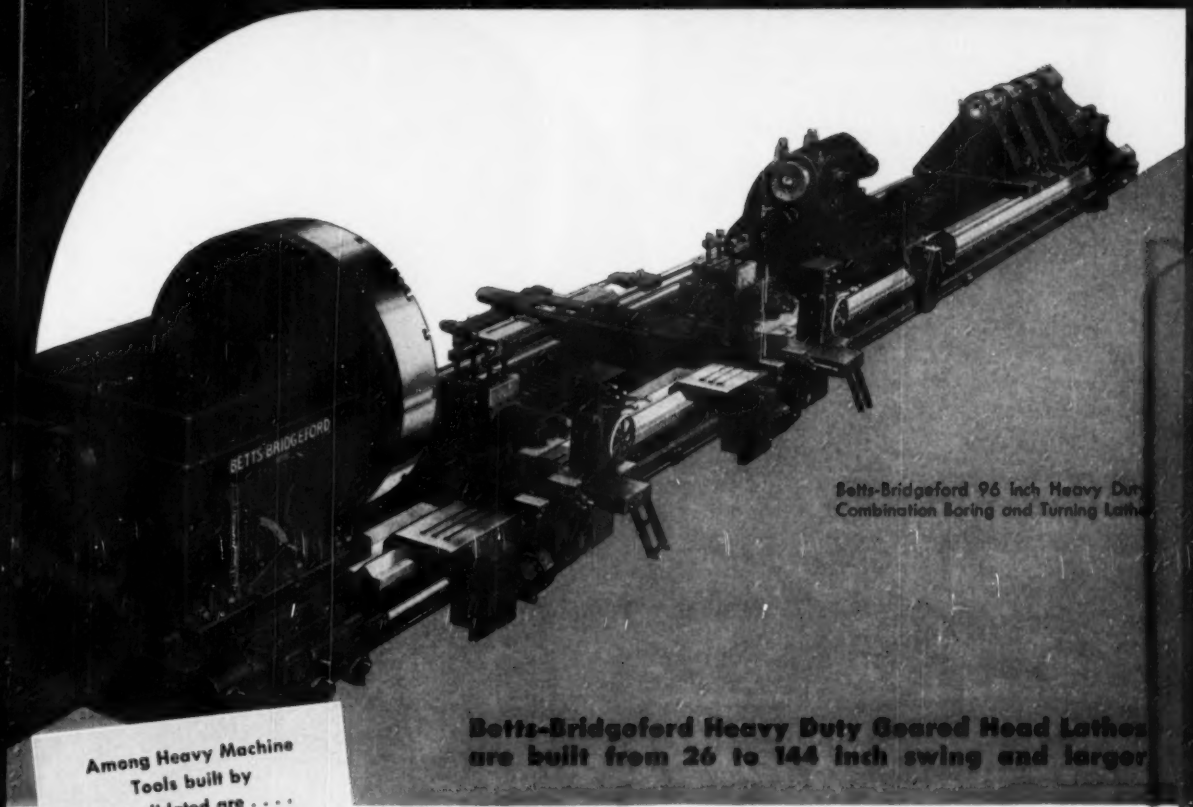
Heavy Duty Geared Head
LATHES



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An earnest effort to produce the world's finest heavy duty machine tools has gone far to establish Consolidated's enviable reputation for designing and building heavy duty geared head lathes . . . a record of achievement extending back to the first Betts-Bridgeford Geared Head Lathe built in 1905. Today's Betts-Bridgeford Lathes have every advanced feature required for modern high production, accuracy and durability.

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CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

If you want RESULTS like this

Production Increased 17%

Tool Life Increased 50%

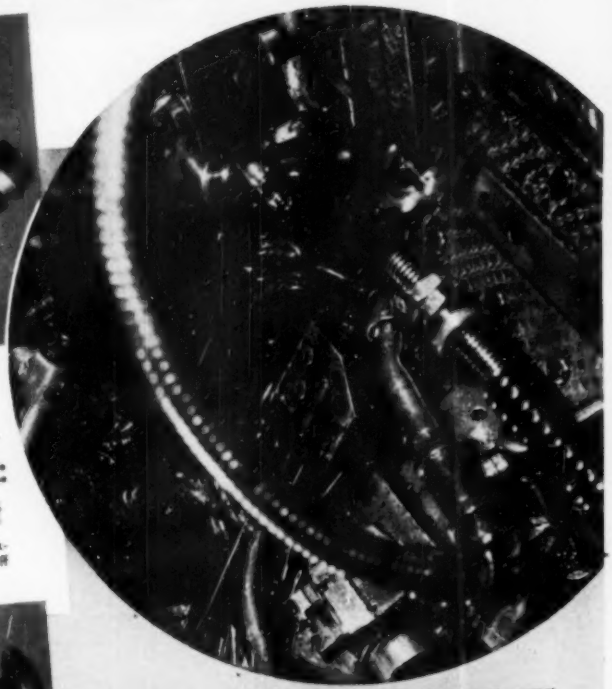
Grade: MX
Size: 3/16" Hex.
Part Name: Grease Fitting
Machine: Davenport Model "B" 9/16" 5 spindle.

Comparative Production:

Grade	SFM	RPM	Sec. Per Part	Production Increase	Tool Life (Parts*)	(Hours)	Tool Life Increase
B1113	253	1930	3.3	—	5,292	7	—
MX	253	1930	3.3	17%	12,096	16	130%
MX	287	2192	2.86		8,894	10.5	50%

* 70% efficiency

Parts made by Universal Lubricating Systems, Inc. (Oakmont, Pa.). Material furnished cold drawn by Wyckoff Steel Company.



Tool Life Increased 50%

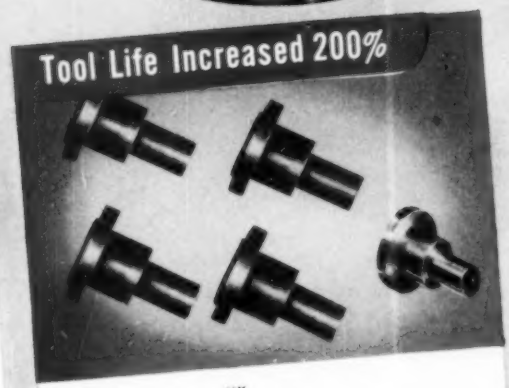
Grade: MX
Size: 3/4" Rd.
Part Name: Shoulder Screw
Machine: Brown & Sharpe No. 2, Standard
Cutting Media: Sulphurized Oil

Comparative Production:

Grade	SFM	RPM	Tool Life Hours	Tool Life Increase
B1113	240	1200	8	—
MX	240	1200	12	50%

Material furnished cold drawn by Bliss & Laughlin, Inc.

Tool Life Increased 200%



Grade: MX
Size: 13/32" Round
Part Name: Pin
Machine: 9/16" RA-6 Acme-Gridley (Double set up, 923 parts per hour each; 1846 parts per hour per machine.)

Comparative Production:

Grade	SFM	RPM	Sec. Per Part	Tool Life (Parts)	(Hours)	Tool Life Increase
B1113	180	1700	3.9	10,338	8	—
MX	180	1700	3.9	31,114	24	200%

Material furnished cold drawn by Bliss & Laughlin, Inc.

. . . . do the job with MX

today's fastest cutting Bessemer screw stock!

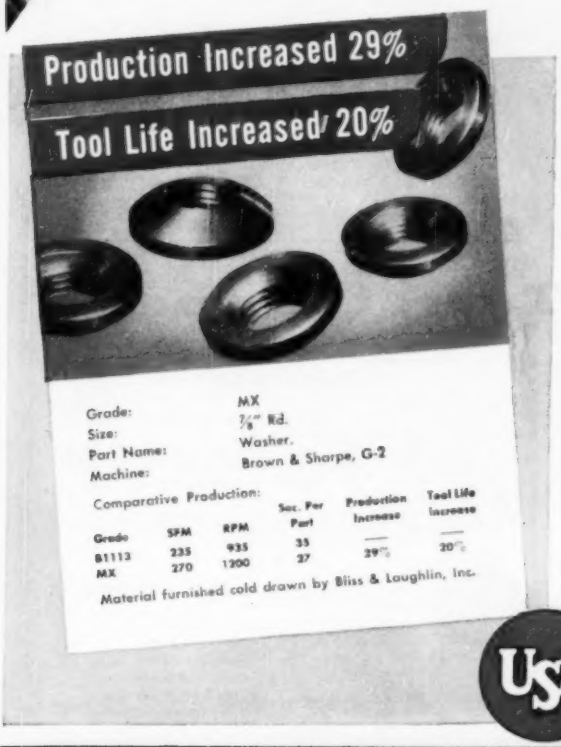
WEEK after week, as more and more U·S·S Free-Machining MX Bar Stock is being rushed into production by the screw machine industry, the evidence accumulates. Shop after shop reports that, both in output and tool life, *MX consistently out-performs standard B-1113 stock.*

The results illustrated here are typical. On other similar jobs output increases have run as high as 54%—tool life has in some cases been more than doubled. And parts machined from MX have a smoother, brighter finish . . . threads are sharper . . . and dimensions are more closely maintained.

U·S·S Free-Machining MX is the product of 10 years' experimentation and research in quest of a faster-cutting screw stock. Actual production runs are merely corroborating what hundreds of test runs had already clearly indicated—that MX is the fastest-cutting, most efficient, and most economical Bessemer screw stock developed to date.

In initial cost, MX is slightly higher than standard B-1113 Screw Stock but parts made from MX *cost less per unit*. And remember this, higher output, longer tool life, fewer rejects and finer finish are all obtainable with MX, *without* the need of special operating procedure. Even when operating at higher speeds, MX requires no special tools or tool grinding.

If you want to increase production and reduce your costs, give MX a trial. Find out how this new free-cutting bar stock works on your equipment. MX is being produced in the popular bar shapes and sizes. You can obtain it in cold-finished bars from your regular supplier. In hot-rolled bars MX is available through our nearest district sales office. If you want to know more about it, a qualified metallurgical representative will be glad to give you the exciting facts.


Production Increased 29%
Tool Life Increased 20%
Grade: MX
Size: 7/8" Rd.
Part Name: Washer.
Machine: Brown & Sharpe, G-2
Comparative Production:
Grade | SFM | RPM | Sec. Per Part | Production Increase | Tool Life Increase
B1113 | 235 | 935 | 35 | — | —
MX | 270 | 1200 | 27 | 29% | 20%
Material furnished cold drawn by Bliss & Laughlin, Inc.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST TO COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carnegie-Illinois Steel Corporation
Room 2134 Carnegie Bldg., Pittsburgh 30, Pa.

☐ Please send me a copy of MX bulletin.
☐ Please have your representative call.

Name.....

Company.....

Address.....

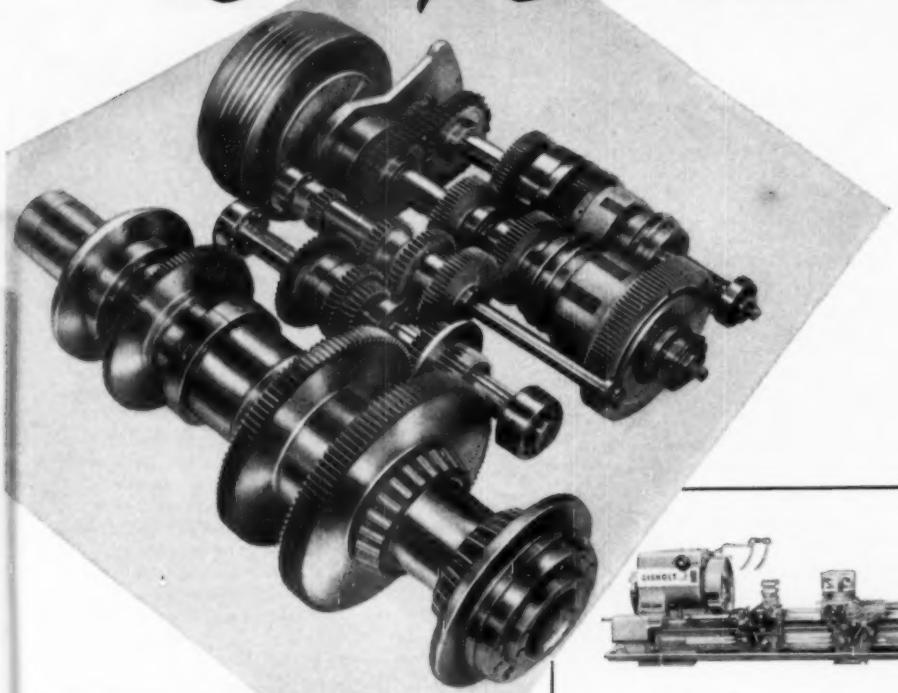
City.....Zone....State.....

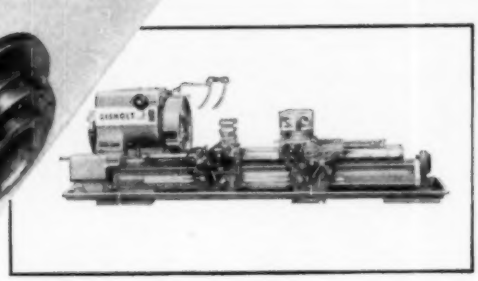
USS

UNITED STATES STEEL

RUGGED POWER

Silky Smooth





GISHOLT

Saddle Type Turret Lathes

Here's how modern Gisholts are geared for greater production—to deliver smooth, vibrationless power—instantly responsive—dependable for years to come. Note these outstanding features:

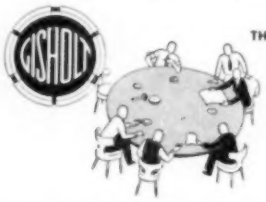
1 *Gears* . . . Husky headstock gearing will carry all the horsepower and all the load of today's tools, as well as that of the foreseeable future. Rigidity is complete from the massive headstock casting right through to the ground teeth in each gear.

2 *Clutches* . . . Warner Electric Clutches inside the drive pulley do all forward and reverse driving, as well as inching and braking. They never need adjustment and give the smoothest acceleration and braking power ever put on a turret lathe. Instant HI-LO speed changes are obtained at the touch of a finger through hydraulically operated multiple disc clutches.

3 *Bearings* . . . Two precision tapered roller bearings at the front of the spindle, together with the precision ball bearing at the rear, carry all the radial and thrust load you can give them.

Why not get all the facts? A new bulletin on Gisholt 3L, 4L, 5L Saddle Type Turret Lathes is just off the press. Write for it.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



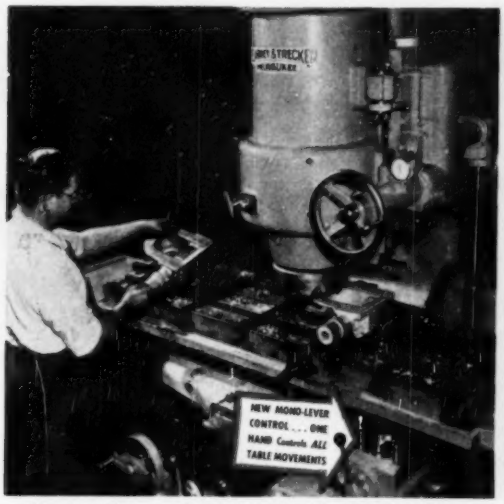
THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Looking for savings?

48% PRODUCTION BOOST REPORTED ON THIS OPERATION



Here's a Kearney & Trecker Chucking Table milling machine with automatic cycle and Mono-Lever Control giving a 48% boost to production of this worm wheel housing. Mono-Lever Control and automatic table operation is the answer.

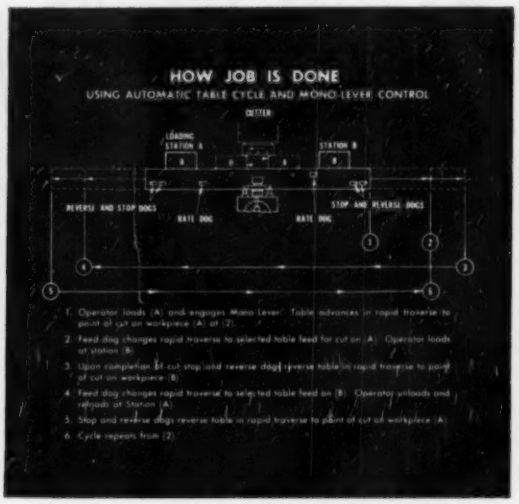

HOW JOB IS DONE
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL
CUTTER
LOADING STATION A
STATION B
REVERSE AND STOP DOGS
RATE DOG
STOP AND REVERSE DOGS
RATE DOG
1. Operator loads (A) and engages Mono-Lever. Table advances in rapid traverse to point of cut on workpiece (A) at (2).
2. Feed dog changes rapid traverse to selected table feed for cut on (A). Operator loads at station (B).
3. Upon completion of cut stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (B).
4. Feed dog changes rapid traverse to selected table feed on (B). Operator unloads and reloads at Station (A).
5. Stop and reverse dogs reverse table in rapid traverse to point of cut on workpiece (A).
6. Cycle repeats from (2).

Diagram shows setup for reciprocal milling. Operator engages Mono-Lever only once for entire run — spends the rest of his time loading and unloading workpieces. Table moves constantly, idle cutter time is at a minimum.

COMPARE

Production by old method.

Production gain using a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.

48%

HERE'S GRAPHIC PROOF OF SAVINGS RESULTS

1. The minimum over-all savings reported from any job when done on a Kearney & Trecker Milling Machine with Mono-Lever Control and Automatic Table Cycle.
2. The *majority* of over-all savings from jobs done on these machines fall here.
3. Under favorable conditions, several jobs done on these machines have shown savings like this!

WHEN it comes to boosting production — there's nothing else like them. We mean Kearney & Trecker Milling Machines with Mono-Lever Control and Automatic Table Cycle.

Take a look at the job described here and the bar graph at lower left. See how these machines have cut milling costs for others *16%* to *96%*! Yes, and they can do the same for you!

Contact us or our nearest representative. Get proven facts on how Kearney & Trecker's milling machines with Mono-Lever Control and Automatic Table Cycle can cut your costs, increase your savings. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

How To Use Multiple Tooling and Automatic Cycling For . . .

Increased Production and Lower Turning Costs . . .

Here are three typical turning jobs that illustrate the versatility of Sundstrand Automatic Lathes. You'll note that it makes no difference whether your turning problem is a mass production job running into thousands of pieces . . . a short run of a few pieces . . . or a special turning job, our engineers can show you how to do it *better* and *faster* on Sundstrand Automatic Lathes with quick cycle changeover. *And,* you'll get all of the time saving advantages of multiple tooling and automatic cycling on practically any turning job.

Most turning jobs can be handled with *standard* Sundstrand lathes. However, when the nature of the work is such that these standard machines cannot be tooled to handle the part, our engineers design special attachments or if necessary special lathes to get the most profitable processing method for the job at hand.

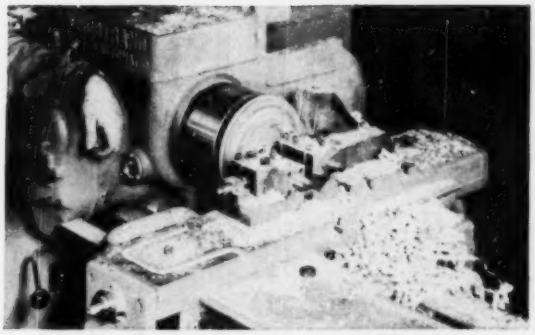
Before you buy *any* turning equipment, investigate Sundstrand Automatic Lathes.

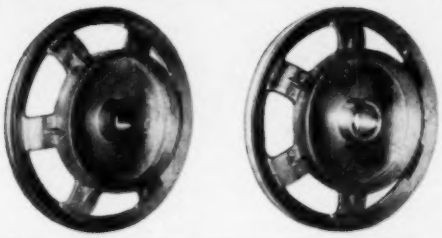
1 Small Lot Production of Many Sizes of Similar Parts

Thirteen hours are saved on each lot of twenty impellers on this short run turning job. Parts are of bronze and used in deep well water pumps. They range in size from 4″ to 10″ in diameter. In old method, parts were machined in three operations requiring three set-ups with special tooling in approximately fifteen hours. Now the same amount of machining is done in two set-ups on Sundstrand Model 10 Automatic Lathes in approximately two hours. The two Model 10 Automatic Lathes are equipped with special cam bars on front and rear tool slides for turning the convex and concave shapes on the impellers. A boring bar is provided for rough and finish boring the center hole. One operator runs both machines producing an average of nineteen completed parts per hour for each operation. Operator's duty consists primarily of loading, starting the automatic machine cycle and unloading after each cycle has been completed.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

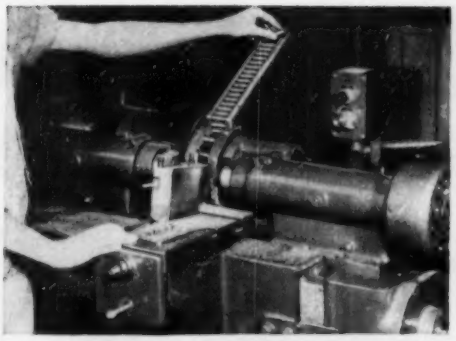
RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

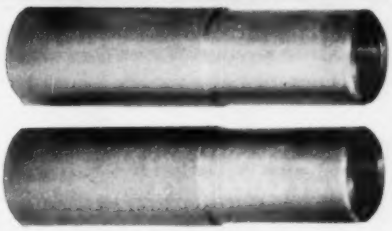




2 Long Run Turning

Illustrated above is a standard Sundstrand Automatic Lathe set-up for continuous production on a washing machine part. Like all Sundstrand Automatic Lathes, it can be tooled in an endless number of ways. In this case, boring, facing, forming and chamfering aluminum clutch pulleys are all performed simultaneously in one automatic cycle. The front carriage mounts the boring bar which bores and faces the center hole. Also, mounted on front carriage are the tools for boring and chamfering the inside of the drum. A form-tool is used on the cross-feeding rear slide to form the "vee" groove on the periphery of the pulley. Production is 69 pulleys per hour.





3 Special Turning Jobs

Approximately 1,020 valve guide bushings are turned per hour on this special Sundstrand lathe. It has a double end drive with a hopper fed automatic drum type loading device. A single pencil type tool is mounted on the front slide. The cycle, consisting of rapid approach, feed, tool relief, unloading, indexing, loading and rapid return, is automatic. Initial starting and stopping is controlled by push button.

An additional feature of this highly productive special lathe is that it can easily be adjusted to handle a number of sleeves and bushings of various sizes.

Get These FREE Bulletins

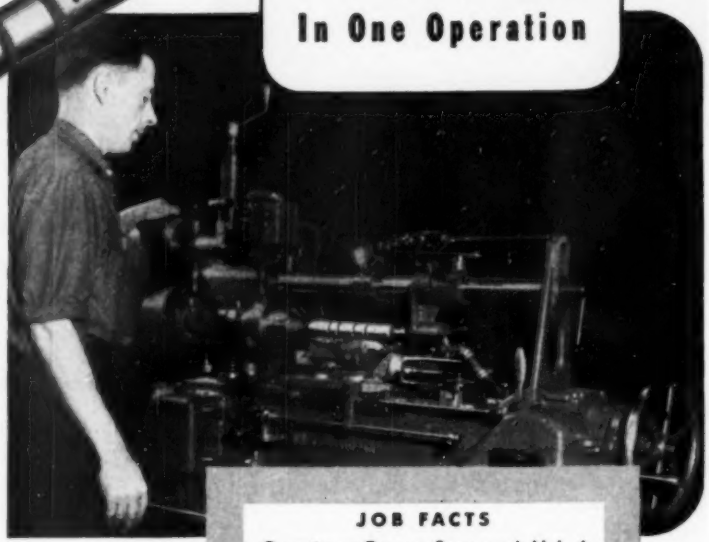
Write for complete specifications of Sundstrand Automatic Lathes. Complete details are included. Ask for bulletins 193.

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

500% PRODUCTION INCREASE!

Locate, Groove and Hob 4 Positions on Shaft In One Operation



Using

SPECIAL FEED AND STOP ARRANGEMENT ON BARBER-COLMAN No. 6-10 HOBBING MACHINE

Special tooling on this Barber-Colman No. 6-10 Hobbing Machine has increased hourly output of these signal shafts from 2 to 12, an increase in production of 500%.

The vertical cam feed and special micrometer stop permit this piece to be located, grooved and hobbed in the four positions shown, all in one set-up. As one section is completed, cam-feed lifts the work, and the hob is manually relocated in the next section by the micrometer stop. This cycle repeats for each section to produce a total of 12 shafts per hour.

If you have work adaptable to the hobbing process, consult your Barber-Colman representative about extra equipment for converting standard machines to specialized jobs. The addition of special tooling often accounts for tremendous increase in production.

JOB FACTS

- Operation — Groove, Space and Hob 4 Sections on Shaft
- Equipment — B-C No. 6-10 Hobbing Machine equipped with extra Cam-Feed and Micrometer-Stop arrangement
- Production — 12 shafts per hour, an increase of 500%
- Accuracy — Sections spaced +.000/−.003"
- Hobs — B-C Shank Type, .100 C.P., ⅝" dia. x 1½" face; produces 100 pieces per sharpening

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6110 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

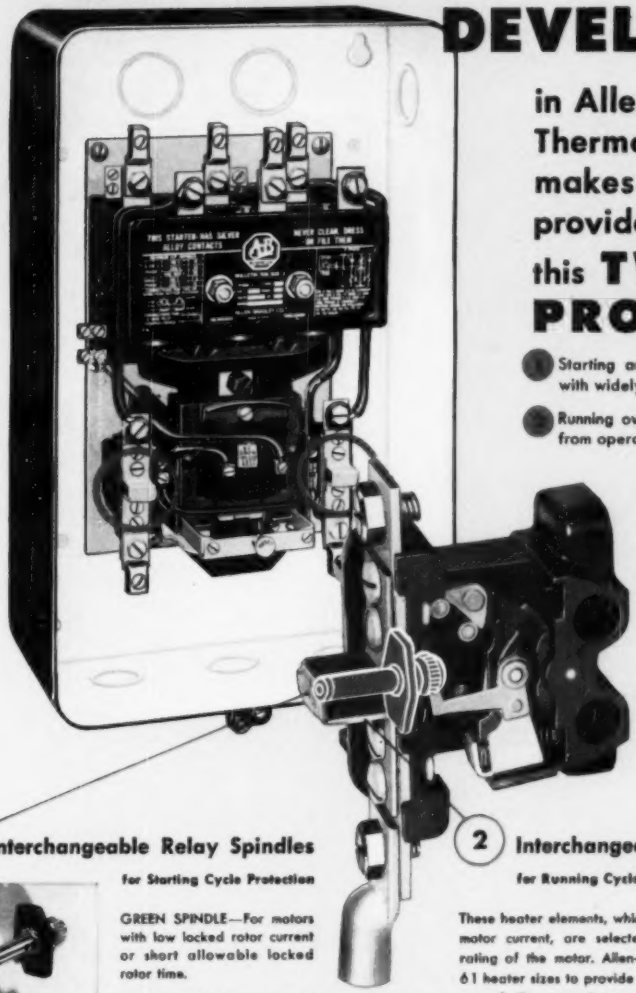
SEND BLUEPRINTS

Submit specifications and prints for proposal on your special Hobbing Applications. No obligation, of course. Write for Bulletin No. 6110.

A SPECTACULAR DEVELOPMENT

in Allen-Bradley Thermal Overload Relays makes it possible to provide your motors with this TWO WAY PROTECTION

1. Starting and locked rotor protection for motors with widely different characteristics.
2. Running overcurrent protection to prevent motor from operating at damaging temperatures.



Now you can match your overload protection for motors under starting and locked rotor conditions as well as under running conditions. Allen-Bradley starters now have interchangeable overload relay spindles to provide various tripping characteristics. The proper spindle gives your motor locked rotor and starting protection. The proper heater element gives running protection. Unnecessary shutdowns will then be eliminated.

1 Interchangeable Relay Spindles

for Starting Cycle Protection

GREEN SPINDLE—For motors with low locked rotor current or short allowable locked rotor time.

RED SPINDLE—For motors with normal allowable locked rotor time and normal starting time.

TAN SPINDLE—For motors with normal allowable locked rotor time and long starting time. Ideal for flywheel and other high inertia loads.

Bulletin 815 Resisto Therm Overload Relay... the type used on most Allen-Bradley motor starters.

2 Interchangeable Heater Elements

for Running Cycle Protection

These heater elements, which carry the main motor current, are selected to match the rating of the motor. Allen-Bradley supplies 61 heater sizes to provide adequate coverage of all motor ratings.

These heaters, when used in conjunction with the three types of spindles illustrated at left, provide 183 combinations to match the characteristics of your motors.

That's why Allen-Bradley motor starters provide full motor protection.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

A-B Quality

2-50-MR

(OVER)

HOW *Interchangeable Spindles and Heater Elements provide* TWO WAY MOTOR PROTECTION on Allen-Bradley Starters

MOST overload relays protect motor windings during the running cycle. But, because motors and motor loads vary so much in character, an overload relay with a single characteristic is unable to provide full motor output and protection under starting and locked rotor conditions.

Now, Allen-Bradley offers *interchangeable* relay spindle assemblies in three types—red, green, or tan—which can be changed in the field from the front of the starter. Each has a different over-current tripping characteristic. The running rating of the relay, however, is determined solely by rating of heater element. Heater element provides full running cycle protection; relay spindle assembly provides full protection during starting cycle and locked rotor condition.

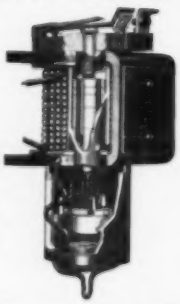
If you will give Allen-Bradley engineers complete information on your starting cycle, normal running current, frequency of starting, and ambient temperatures, they will supply the correct combination of heater unit and relay spindle assembly to fit your motor and load condition.

As a result, it will be possible to keep your motor running at a safe operating temperature during starting, running, and locked rotor conditions—adding years of motor life. Now you can work motors safely to full capacity—eliminating unnecessary, costly shutdowns. Write for full information.

OTHER ALLEN-BRADLEY OVERLOAD RELAYS

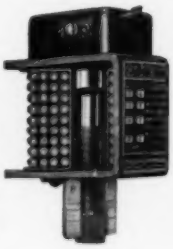
BULLETIN 810
DASHPOT TYPE
MAGNETIC OVERLOAD RELAY

Resets quickly after tripping. Ideal for woodworking and other equipment where motors frequently stall. Trip current and tripping times adjustable. Silicone dashpot fluid practically eliminates changes in tripping time with temperature.



BULLETIN 830
INDUCTO THERM
OVERLOAD RELAY

For accurate overload protection of slip ring and squirrel cage motors having normal allowable locked rotor times and locked rotor currents five or more times full load current. Tripping value easily adjusted over wide range.



Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

A-B Quality

2-50-MR

NIAGARA

Presents a New, Low-Priced

POWER SHEAR FOR LIGHT SHEET METAL

● Here is the new high speed Power Shear that sheet metal men have been waiting for. New advanced engineering . . . new styling . . . new, easy, fast operation.

THE GREATEST DOLLAR *for* DOLLAR SHEAR VALUE YOUR MONEY CAN BUY

● This new Niagara high speed Power Shear is designed for light sheet metal work. One look at its distinctive styling indicates its modern performance.

Fabricated from unbreakable steel plate, it is engineered to combine strength and stiffness for accurate cutting.

Clear visibility of cutting line through cut-outs and over the top of holddown facilitates shearing to an accurate layout line.

Niagara Alloy Tool Steel Knives heat treated to a high degree of hardness and toughness and precision ground for accuracy provide keen cutting edges for longer service between grinds.

Quick Acting Back Gauge and convenient front and side gauges.

Capacity—20 gauge.

30, 36 and 42 inch cutting lengths

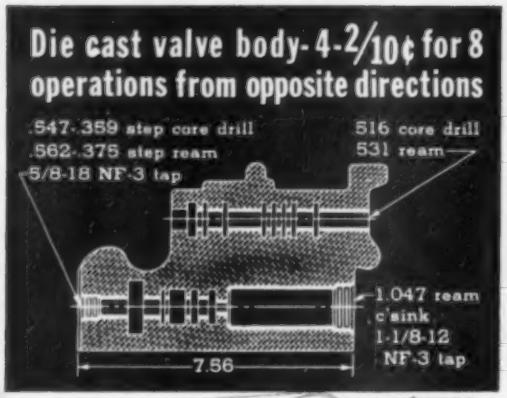
125 cuts per minute.

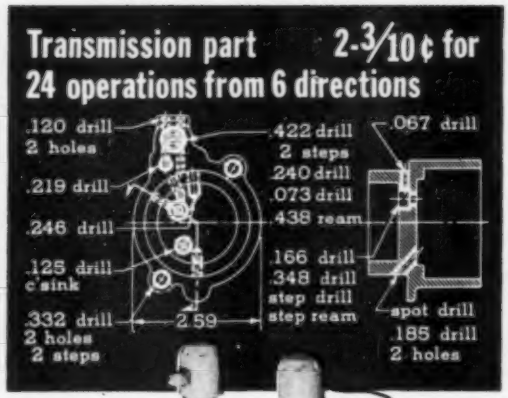
Write for complete information and low prices

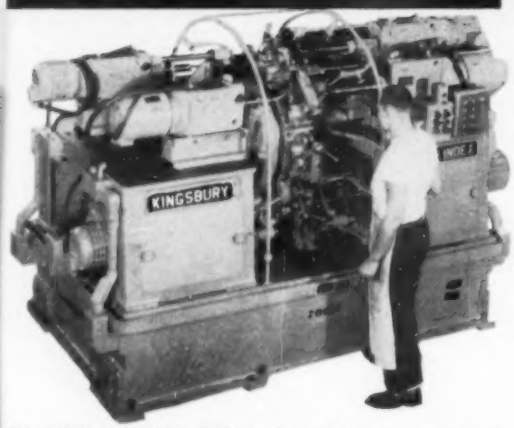
See how the new PANCAKE MOTOR DRIVE provides the most compact construction ever obtained... minimum floor space, maximum safety.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, NEW YORK

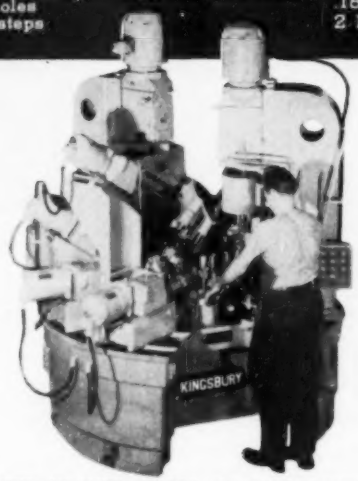
DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK







200 PARTS AN HOUR GROSS. Opposed horizontal units on this vertical indexing machine work on opposite faces of the part in the same chucking—three units on the left face and five on the right. Bushings guide all of the tools but the taps.



330 PARTS AN HOUR GROSS. On this horizontal indexing machine ten units work from six directions: vertical, angular, angular across the index table and horizontal—on the radial line and at two angles to it. Bushings guide 15 of the tools.

Costs go down with many

Automatic drilling and tapping machines work from several directions to close tolerances at low cost

Dear Sir:

Look at the number of operations per hour on these parts:

Die cast valve bodies	1280
Transmission parts	6336
Typewriter parts	2688
Throttle bodies	5440

And here are the average costs for man and machine per operation:

Die cast valve bodies	53/100¢
Transmission parts	10/100¢
Typewriter parts	14/100¢
Throttle bodies	19/100¢

We assumed three things: 1) 80% efficiency. 2) Each man's wage rate would equal the national average for such work. 3) The entire cost of each machine and tooling would be paid for after only 6000 hours of operation, a fraction of its useful life. No power or overhead.

You would probably figure these costs another way. But you would get the same result: Kingsburys give low unit costs on high production work.

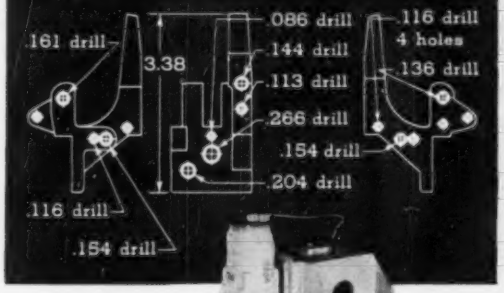
Why unit costs are low

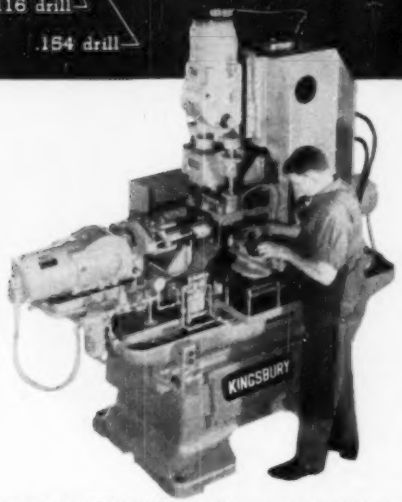
You need several general-purpose machines and several operators to keep up with one Kingsbury and one operator. That costs more, even if your machines would otherwise be idle. You pay for more operators, more supervision, more handling and more space. If your production is high enough to keep a Kingsbury busy most of the time, it would pay for itself in a matter of months.

A visitor argues a point

Somebody once disputed our claim of one person to a machine. He said, "I just saw a line of Kingsburys — big ones with 25 units apiece. All of them needed two chaps. One chap operated it. Another chap had to work full time hauling away chips." We said he exaggerated and stuck to our claim.

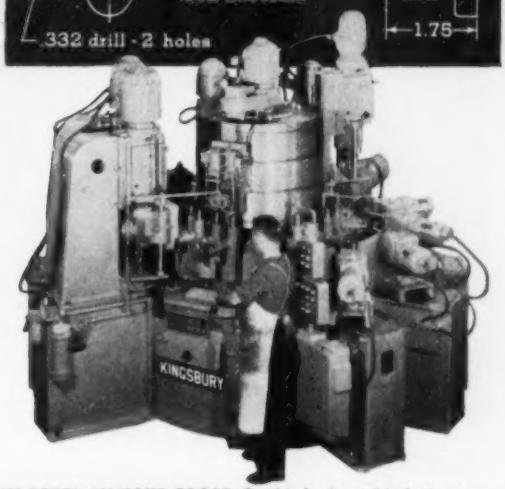
Typewriter part **1-9/10¢ for**
14 operations from 3 directions





240 PARTS AN HOUR GROSS. The operator loads two parts in the fixture. Three units drill five holes in one part and nine in the other part. The operator indexes the fixture 180° and the units complete both parts. Bushings guide all 14 of the drills.

Throttle body **3-2/10¢ for**
17 operations from 5 directions



400 PARTS AN HOUR GROSS. On this horizontal indexing machine with central column, 13 units work from five directions: vertical, underneath, horizontal, horizontal on the backstroke (milling) and horizontal off radial line. Bushings guide 9 tools.

operations per man-hour

Work from many directions

Each setup above uses a different basic machine. With each type, independent units can operate from different directions in the same chucking of the work. Because we can choose from so many basic machines and units, we can find efficient setups for many jobs.

Close tolerances

Bushings locate tools accurately. Guide bushings are in the fixtures or in plates that pilot to the fixtures. In the four Kingsburys shown, bushings guide 44 of the 63 tools. They do not guide taps, milling cutters or tools that locate from other operations.

Operations are in exact relationship. Each Kingsbury completes many operations in one chucking of the work.

Machining is uniform. Units with automatic cycles and cam feeds perform all operations.

Let's talk about your job

A specific proposal will show you if a Kingsbury can save you money. Just send a print of a high production part to our Mr. L. A. Carll. Tell him the operations and hourly output you need. Or ask him for free bulletins that show 53 setups.

Sincerely,
Kingsbury Machine Tool Corp.
35 Laurel Street, Keene, N. H.

P.S. Don't get the idea we do only *tough* jobs. We can save you money with simple setups too. Just ask us.

KINGSBURY
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

SQUARE D's *New*

SAFETY SWITCHES

***Types A, C and D**

Backed by 40 years' DESIGN LEADERSHIP

The remarkable superiority of this new switch line is reflected in these TYPE A design and operating features:

MODERN STYLING is both functional and attractive.

COMPACTNESS obtained without sacrifice of wiring convenience.

FULL COVER INTERLOCK has attachment that locks switch "ON" or "OFF" with 1, 2, 3 or 4 padlocks of nearly any size or shape.

SIMPLE MECHANISM—quick make-and-break action—no dead center.

SILVER-PLATED current-carrying parts.

EXPOSED BLADES permit visual checks of switch operation.

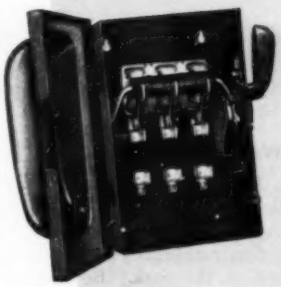
DEAD-FRONT line terminals are protected by hinged arc chamber cover.

MAGNETIC ARC PLATE adds to unusually high rupturing capacity.

POSITIVE PRESSURE jaws and fuse clips, steel reinforced, silver-plated.

NON-TRACKING insulation used in base. Melamine insulating cross-bar.

REMOVABLE PRESSURE CONNECTORS permit substitution of solder lugs, where preferred.



**Types C and D similar to Type A in appearance—differ in construction details*

NOW in production: 30, 60, 100 and 200 ampere sizes

Write **for Bulletin 3100 • Square D Company, 6060 Rivard Street, Detroit 11, Michigan**

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

MAINTENANCE COST FOR THESE 4 MACHINES: *LESS THAN 2 7/10¢ PER HOUR*

FOR 25,913 HOURS' CONTINUOUS PRODUCTION!

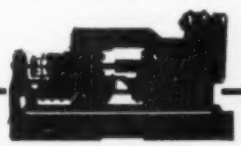
Here's a battery of four machines that has been continuously operating for 25,913 hours, producing a total of 1,215,853 pieces —and at an over-all maintenance cost of only $683.40. That figure covers both labor and materials.

In other words, maintenance averaged only $170.85 per machine! And bear in mind, this remarkable record was made on heavy duty work—the kind that puts a machine to severe test for stamina and sustained accuracy.

Acme-Gridley Automatics are built with basic design advantages for such low-cost performance: The rigid, box-type frame resists vibration, *holds* precision on heavy cuts. Positive, direct, quick-change camming eliminates the need for adjustments to take up wear in loose-connected linkages. It will pay you to investigate Acme-Gridley Automatics when you want the most in metal turning—more good pieces in the pan—with minimum maintenance. May we give you more information?

JOB FACTS

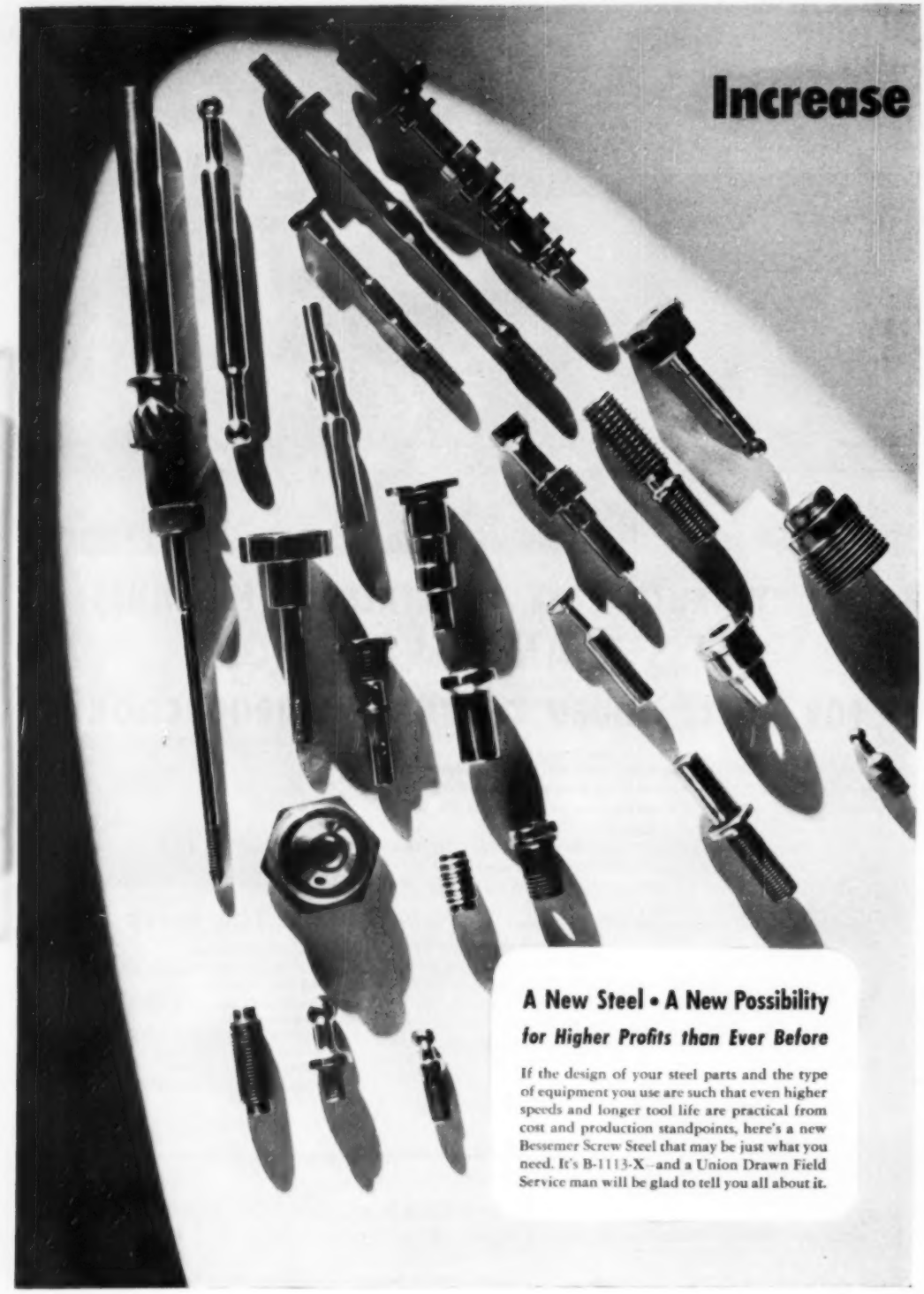
Part: Track Link Bushing.
Size: 2⅝" Diam. x 8" long; 7½ lbs.
Material: Steel Tubing.
Machine: Acme-Gridley 2⅝" RB-8 Spindle Automatic Bar Machine.
Performance: Battery of 4 machines operating continuously for 25,913 hours.
Production: 1,215,853 pieces.
Maintenance Charges: $683.40 total (including labor and materials).



ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO


Increase
A New Steel • A New Possibility
for Higher Profits than Ever Before
If the design of your steel parts and the type of equipment you use are such that even higher speeds and longer tool life are practical from cost and production standpoints, here's a new Bessemer Screw Steel that may be just what you need. It's B-1113-X—and a Union Drawn Field Service man will be glad to tell you all about it.

your spread between profit and loss

through this improved

MACHINABILITY

● Even though overhead, material and other operating costs are fixed, there still is one way to cut unit costs in the mass production of duplicate steel parts. There still is one way to increase your spread between profit and loss. It's through better MACHINABILITY in the steel bars you use.

That's the first reason why you should specify Republic Union Cold Drawn Steel Bars for every application involving machining.

For more than 60 years, better MACHINABILITY has been the primary objective of Union Drawn metallurgists and engineers. They've spent long hours in laboratories ferreting out the "whys" and "hows" of machining operations. They've visited customers' plants and worked beside the men who set up and run the "automatics." They've cut up tons of standard and experimental analyses on the latest type "automatics" in Union Drawn plants.

Time after time, the experience thus gained has been passed on to customers through a continuous improvement in Republic Union Cold Drawn Steels—carbon, alloy and stainless. Speeds and feeds have been stepped up. Cutting performance has become uniform bar after bar—shipment after shipment. Abrasive elements have disappeared. Tool life has been lengthened. Machined surfaces are brighter, smoother. Production efficiency has climbed. Output has increased. Unit production costs have dropped to new low levels.

Reason No. 2 is this: These same experienced metallurgists and engineers are ready NOW to help you obtain profit-making results by working with your engineers and operators right in your own plant.

Want to increase your spread between profit and loss on steel parts production? Call your nearest Republic District Sales Office or write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic

REPUBLIC STEEL

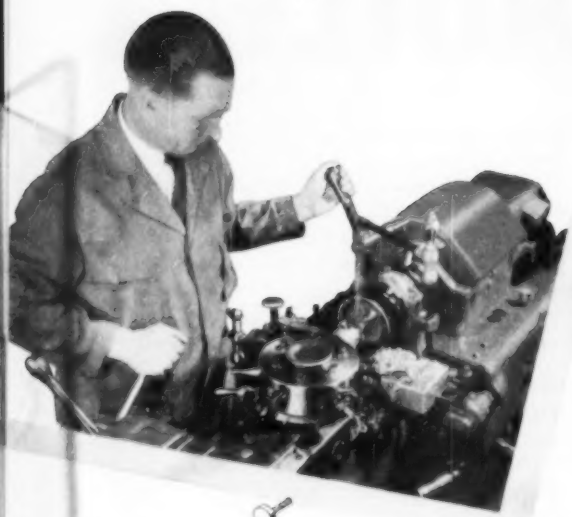
US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Endure Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

shop strategy

...that brings costs down



For short runs on bar stock or on second operations—

use Brown & Sharpe Wire Feed Screw Machines...

You'll get — • unusually fast, simple set-ups that reduce time of change-over and necessity of special tooling. • a choice of three machine sizes — each designed for top efficiency on work within its own range. • wide selection of spindle speeds (in two-speed combinations) permits efficient machining of materials from free-cutting brass to tough alloy steels. • advantages of simplified controls and semi-automatic movements that minimize operating fatigue.

No. 0 . . . Hole through largest regular feeding finger, $\frac{1}{4}$". Turns any length to $2\frac{1}{4}$". Feed tube of $\frac{1}{8}$" capacity for light to medium work can be furnished.

BROWN &

A SOUND INVESTMENT FOR AUTOMATIC SCREW AND SECOND OPERATIONS DEPARTMENTS

Wire feed screw machines can take over work that wouldn't be practical for efficient and economical handling on "automatics". Their time-saving, cost-saving advantages for short runs in turning, drilling, forming and threading parts, from the bar or second handling, pay off in better shop efficiency. What's more, they make possible bigger returns on your investment in automatics.

The wide range of spindle speeds on Brown & Sharpe Wire Feed Screw Machines permits you to select the most efficient speed for the job . . . whether the material is free-cutting brass or one of the tough-alloy steels. In addition, in most cases, you can use the same tools and the same collets and fingers as on your Brown & Sharpe automatics.

Specific Features of Brown & Sharpe Wire Feed Screw Machines

Simple to operate . . . for example, a single lever controls the spindle — for high speed, low speed and stop. Stop position is particularly valuable for second operations. Automatic chuck and bar feed is tripped quickly by hand or automatically.

Minimum number of controls . . . waste motion eliminated. Operator fatigue reduced. Efficiency raised.

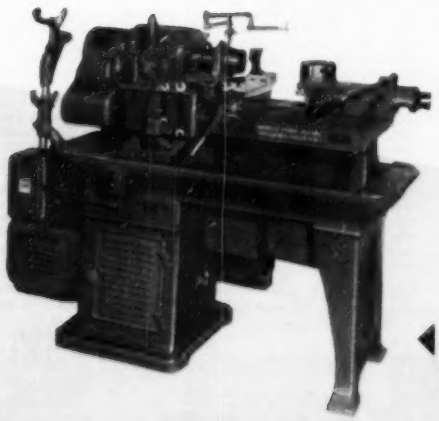
Stock fed in ¾ second . . . rapid power feed of stock and the automatic chuck save time — reduce cost per piece.

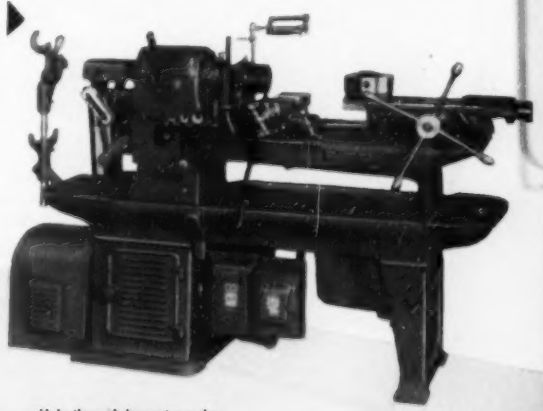
Twenty spindle speeds . . . 20 changes of spindle speed (ten high-low combinations)—all in same direction or in opposite directions. Approximate ratios, fast to slow, are 5 to 1.

Ample spindle capacity . . . feed tube regularly furnished with each machine accommodates all bar stock up to rated capacity of machine. Oversize feed tube is available for work of larger diameter than the rated machine capacity, or work can be held or chucked in extra capacity collets.

Here's the type of shop strategy that's timely and profitable. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

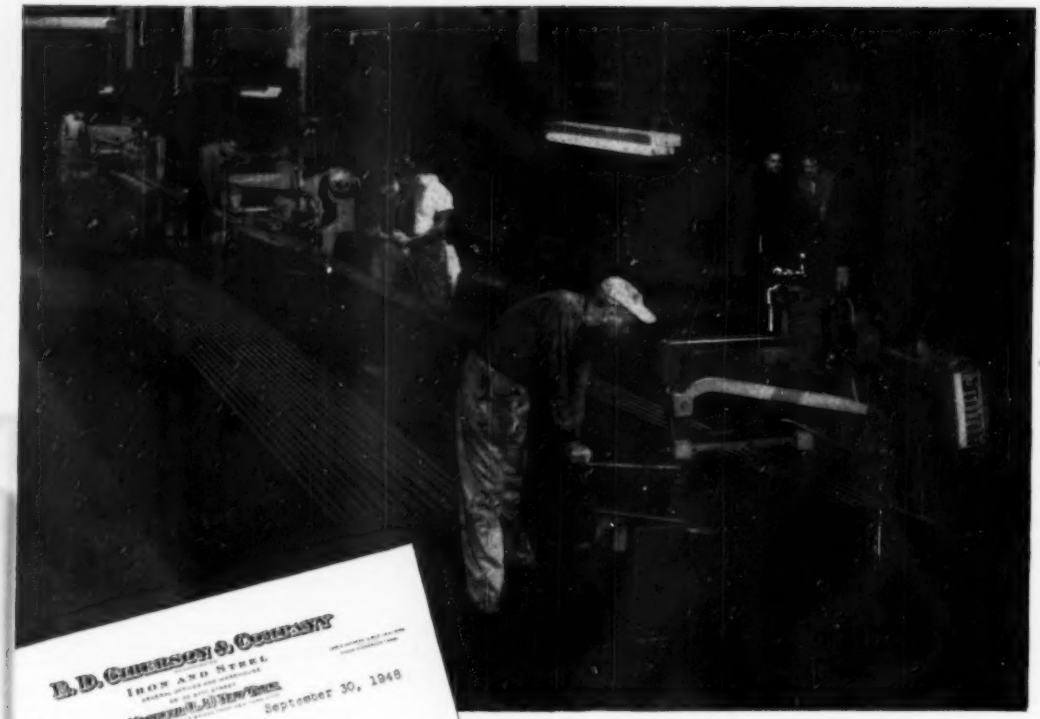
No. 2 . . . Hole through largest regular capacity feeding finger, 1". Turns any length to 6". Feed tube of 1 ¼" capacity for light to medium work can be furnished.





No. 1 . . . Hole through largest regular feeding finger, ⅝". Turns any length to 4". Feed tube of ⅞" capacity for light to medium work can be furnished.

SHARPE B·S



E. D. GIBERSON & COMPANY
IRON AND STEEL

September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a Century as direct distributors of Boiler Tubes, Condenser Tubes in seamless steel, electric welded steel and stainless steel, as well as seamless and welded Mechanical Steel Pipe and Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have cut in our warehouse many million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,

E. D. GIBERSON & COMPANY, INC.

E. D. Giberson

President

Another Tubing Warehouse

"Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growing list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths."

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

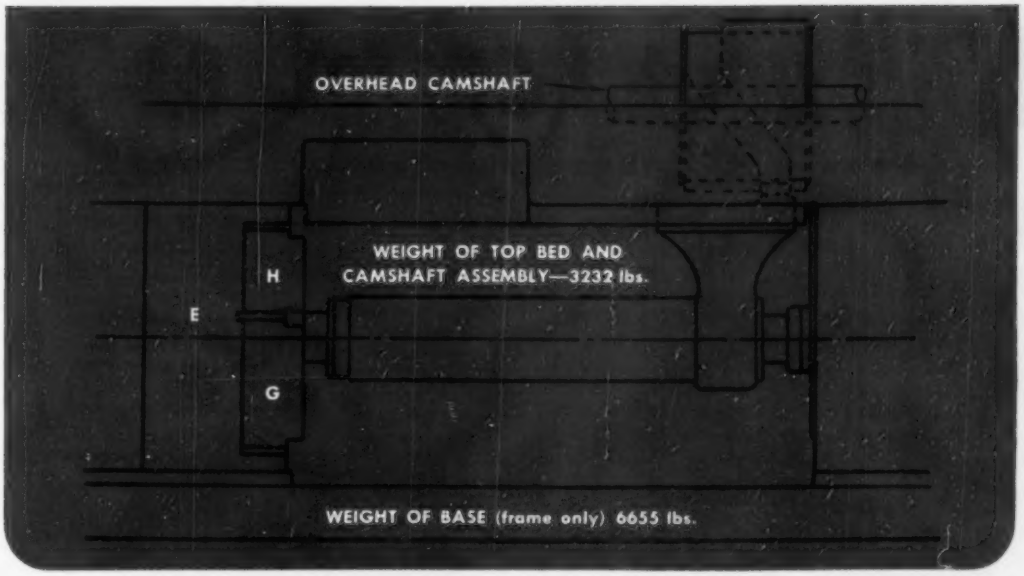
Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations."

SEND FOR CATALOG No.

Metal Cutting
MARVEL SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. COMPANY

5700 WEST BLOOMINGDALE AVENUE "The Hack Saw People" CHICAGO 30, ILLINOIS



PROFITS BEGIN WITH GOOD BUYING

Machine selection is often the difference between profit and loss, and the choice of one brand over another can be a vital decision. A machine that is not put to its best use is theoretically idle. A poor selection takes toll of all brands of the same type through greater sales resistance and cost. The information prepared for better machine selection before the purchase should be as thorough and useful as that of the operation and maintenance hand books supplied after.

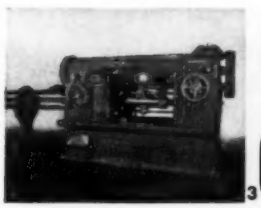
The information given above and below is useful in determining the facility of the 1½" Six Spindle CONOMATIC MAIN CROSS SLIDES:

1. **They have never been equalled for dependable, low cost operation and maintenance in the handling of wide, heavy, form cuts.**

The four, rectangular, box type, CROSS SLIDES, H and G, on front and rear sides of the machine, are nickel moly iron normalized. Their total weight is 296 lbs. They are held in axial position by retaining gibs against the finished wall surface of the machine frame support. They are held in parallel, radial position by their top and bottom flat bearing surfaces with tapered gib adjustment. The total area of their radial bearings, alone, is 444½ square inches.

2. **They have a higher maximum load recommendation than do the cross slides of other "automatics."**

The maximum load recommendation for each MAIN CROSS SLIDE is 3200 ft. lbs. The short (22" high) 11¾" by 44" Frame Support, E, weighs 802 lbs. net. It holds the slides between, and in close proximity to, nearly FIVE TONS of "bridged" construction.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

3 Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Will your new lathe

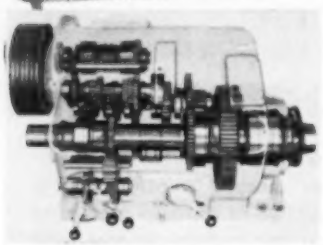
have *all* these important features?

You're not getting *all the value* your money can buy if your next lathe does not include *all* these important features. All these standard features, proved in operation, mean greater profits . . . in any size shop.

Many of the features listed here are exclusive with Lodge & Shipley "X" Lathes; others are not. But—no other lathe, only the Model "X" Lathe, combines *ALL* these profit-making features. DON'T BE SATISFIED WITH LESS!

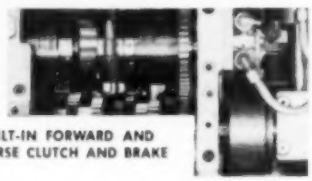
USE THESE FEATURES AS A CHECK LIST FOR YOUR NEXT LATHE

- 24 Spindle Speeds
- Built-in forward and reverse clutch and automatic brake
- Totally enclosed quick change gear box
- "Sustained alignment" bedways of hardened steel
- Positive feed clutches
- Inverted dovetail slides
- 3 bearing spindle mounting
- Slide rule calculator
- 20 H.P. in small sizes 30 H.P. in larger sizes
- All-Automatic lubrication
- Hardened cross-feed screw threads with compensating nuts
- Hardened spindle nose
- Sliding spur gears



24 SPINDLE SPEEDS

Why 24? Because fewer spindle speeds will not provide the most efficient cut speed for every tool and material. 24 speeds provide a more selective range from low-speed precision chasing up to the fastest carbide turning. The right speed means "More Profits".



BUILT-IN FORWARD AND REVERSE CLUTCH AND BRAKE

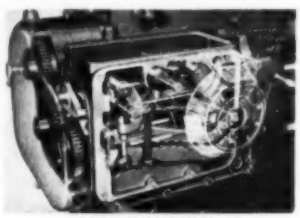
Gives easy control of carriage traverse for non-standard threading without use of reverse to leadscrew, spindle reversal for backing-off taps, and reverse spindle rotation for turning and boring where that is more advantageous. Do greater variety of work, get "Greater Profits".

"SUSTAINED ALIGNMENT" BEDWAYS of HARDENED STEEL

Exclusive Model X bedways guide carriage from front combined straight and angular way only. Thus the carriage cannot lift or bellmouth under the heaviest cuts. Renewable hardened and ground steel ways permanently located on the bed by a tongue and groove, make wear immeasurable. Produce finest work for years to come: "Sustain Profits"

SLIDE RULE CALCULATOR

Eliminating guesswork, tedious figuring and mistakes, the slide rule calculator takes the question mark out of speed settings. Calculator visually determines RPM and lever settings for most economical cut speeds for a given diameter. Eliminate guesswork; add "More Profits".



TOTALLY ENCLOSED QUICK CHANGE GEAR BOX

Patented, dial-operated control of 55 threads and feeds eliminates time formerly wasted trying to move old-fashioned sliding tumbler. Totally enclosed, oil tight box prevents foreign matter damaging precision gearing and makes possible automatic, recirculating, lubrication. Low maintenance costs spell "More Profits"

20 H.P. BUILT-IN TO SMALL SIZES 30 H.P. IN LARGER SIZES

Model "X" Lathes easily transmit 20 H.P. in the high range of small sizes and 30 H.P. in that of the larger sizes. Calculator shows maximum H.P. that may be transmitted at each RPM; Ammeter (optional, extra cost) indicates H.P. supplied to the machine. With this combination an operator can safely use the greater H.P. available. More Horsepower means "More Profits"

INVERTED DOVETAIL SLIDES

Don't let "pared down" swing capacity limit your range of work. Greater swing over the cross slide and greater strength in the compound rest assembly have been attained by the unique inverted dovetails construction. The cross slide is appreciably lowered in all sizes of Model X Lathes. Machine a wider range of work; "Increase Profits".

Write for new "Features Catalog #200" for full information on these essential features for the lathe buyer. Use company letterhead, please.

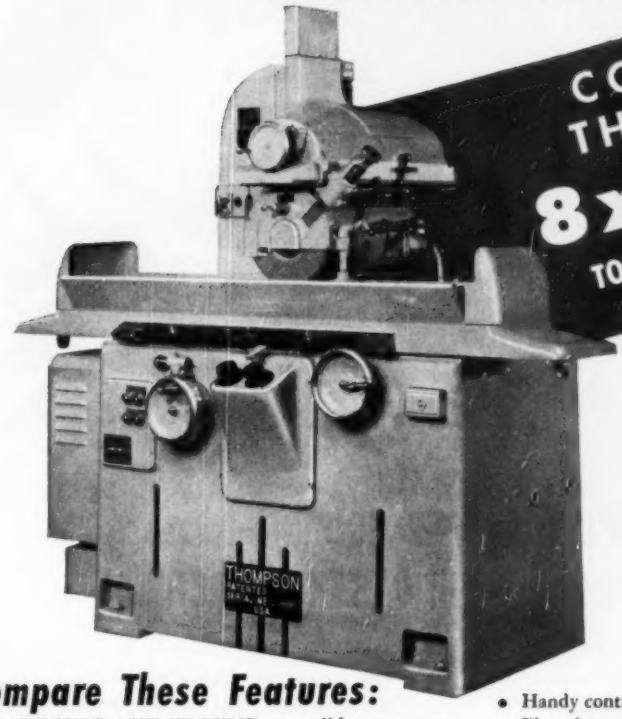
THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Announcing The New Thompson Type 2F

SUPER PRECISION

Tool Room Grinder

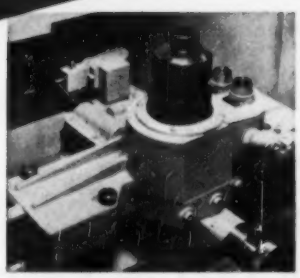


COMPARE THIS NEW

8 x 10 x 24

TOOL ROOM GRINDER

(Write for specifications)



MAGNIFIED TEMPLATE DIAMOND WHEEL DRESSER with ten to one magnification available in universal manually operated and electric. Other auxiliary Thompson Type 2F equipment includes "Coolant Thru the Wheel" feature and Magnetic Chucks with control.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Handy control panel.
- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Copyright 1950—The Thompson Grinder Co.

"The quality of the last casting is just as precise as the first." Al Holder, Superintendent, Peckinpaugh Metals Corp., checks a gate of four castings the machine operator has just removed from their Model 400 Cleveland. A close-up of these castings is shown at right.

No "Hold-up" Here!

600 Paper Popper Pistols per Hour Die Cast on a Cleveland Die Casting Machine

Here's another example of fast, accurate, *profitable* die casting on CLEVELAND Die Casting Machines. This toy pistol is die cast of zinc at the Peckinpaugh Metals Corp., Cleveland, Ohio, for the Meldon Bros. Company, on a Model 400 Cleveland machine. 2¼ lbs. of metal are injected into a four-cavity die, producing two right-hand and two left-hand sections per shot, at an average rate of 300 shots per hour!

These CLEVELAND-produced castings keep assembly and finishing costs *low*. Although the mating edges on each section are but 3/64 of an inch in thickness, Cleveland's "squeeze-to-the-shot" produces a strong, dense casting, free from distortion. No machining other than flash removal is required to make both halves fit together accurately. The surface of each casting is smooth; lettering and design details are sharp and clean; very little preparation is required for final finishing.

Whether the casting is large or small, simple or intricate, *you* will produce a better job, faster, at less cost with Cleveland Die Casting Machines. Investigate their advantages for your production.

Three machine sizes: Model 400 Cleveland: 36" x 38" die plates. Model 200: 27" x 27" die plates. Model 50: 22" x 18" die plates. For machine specifications, write for bulletins.

Remember, *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

NOW...

CARBON ANALYSIS

in a FLASH

...ELECTRONICALLY WITH

NEW STANDARDS OF ACCURACY

- Ready in the morning in 57 seconds. Instantly from then on.
- 90% less power consumption.
- No limit on temperatures.
- Glass combustion tube provides visibility of operation.
- Combustion tubes at half the cost, last many times longer.
- Shorter tube advantageous for volumetric method.
- No elements to burn out.
- Heats nothing but the sample.
- Eliminates excess heat from laboratory.

For further details ask for Bulletin 910.

VOLUMETRIC
GRAVIMETRIC

	for...
Carbon	Steel
Sulphur	Cast Iron
Selenium	Alloys
	Stainless

LINDBERG LABORATORY DIVISION

Lindberg Engineering Company • 2445 West Hubbard Street • Chicago 12, Illinois

Do you have METAL SURFACE TREATMENT PROBLEMS ?

Here are PARKER products to solve them

All of our work is on the surface! For 34 years we've lived with the problems of metal surface preparation and preservation. Parker research has discovered how to deal with many specialized problems; field experience for three decades and in thousands of plants has taught us many answers, too. Parker Rust Proof Company's vast experience, and the famous Parker Products, are at your command to solve *your* metal surface treatment problems.

Want to inhibit rust? ...PARCO COMPOUND

This is an improvement on the original Parker Product, which has set the standards for controlling rust on iron and steel for more than thirty years. Parco Compound converts the surface of these metals to a nonmetallic phosphate coating that is highly efficient in inhibiting the forces of corrosion. It's an easy, positive treatment, requiring only simple equipment.

Parco Compound treats small and large pieces with equal ease. The characteristic color produced by Parco Compound is soft, dark gray. Parcolacs, paint, oils, stain, or wax finishes are used over this versatile rust inhibitor.

Want rust preventive finishes? ...PARCOLACS

This large class of specialized products includes waxes, stains, and oils of varying characteristics to meet the many different requirements of industry. There are Parcolacs for dip application, for centrifuge, for brushing and spray. You can get high

efficiency in Parcolacs for use as rust preventive finishes; others have been developed to add pleasant, non-marking, high appearance qualities. Your own requirements will dictate which Parcolac is best for your use.

Want improved paint adhesion and rust resistance?
. . . BONDERITE

Most widely used of all Parker Products, Bonderite adds quality to many of the most attractive metal products manufactured today. It's under the paint on automobile bodies, fenders, and sheet metal. It is used by most refrigerator manufacturers, and on a great many of the finest domestic appliances. Wherever lasting fine appearance is important on a painted metal product, *there* is a place for Bonderite.

Bonderite converts the surface of metal to a nonmetallic phosphate coating which is an excellent base for paint and, because of its nonmetallic character, an effective rust resistant.

Bonderite is fast and flexible, and can be used in immersion equipment and in automatic conveyor production lines. It is simple to control, producing positive and uniform results at low cost.

Want faster, smoother draws?
. . . BONDERITE

The crystalline, nonmetallic Bonderite coating brings these benefits to the drawing bench: It holds lubricant, even under great pressure. It prevents metal to metal contact, reducing galling and scoring. It reduces wear on tools and dies, lengthening the life of these expensive parts. It permits deeper, smoother, faster draws. *Cuts metal polishing costs.*

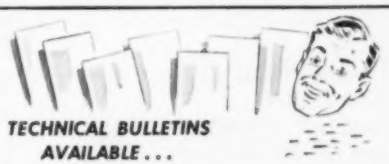
Want wear resistance for friction parts?
. . . PARCO LUBRITE

Faster, smoother break-in, greatly reduced danger of scoring and scuffing, and longer subsequent wear are the advantages Parco Lubrite brings to friction parts. The nonmetallic, crystalline coating holds oil under high operating pressures and temperatures. There's no metal-to-metal contact, and the parts "wear-in" quickly and smoothly.

Want better metal cleaning and rust removal?
. . . PARCO Formulated CLEANERS

Parco Cleaners are formulated to clean better, go farther, with reduced concentrations of cleaner material required. These products do more than remove rust, soil, or grease; they also *condition* the metal for the next step in finishing.

Parco Cleaners include *Solvent and Emulsion* Types, *Acid* Types, *Alkaline* Types, and *Water Conditioners.*



TECHNICAL BULLETINS AVAILABLE . . .

Full information on any of these Parker Products is yours on request. Write for technical bulletins on the Parker Products which can contribute to the solution of your problem and the success of your product.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

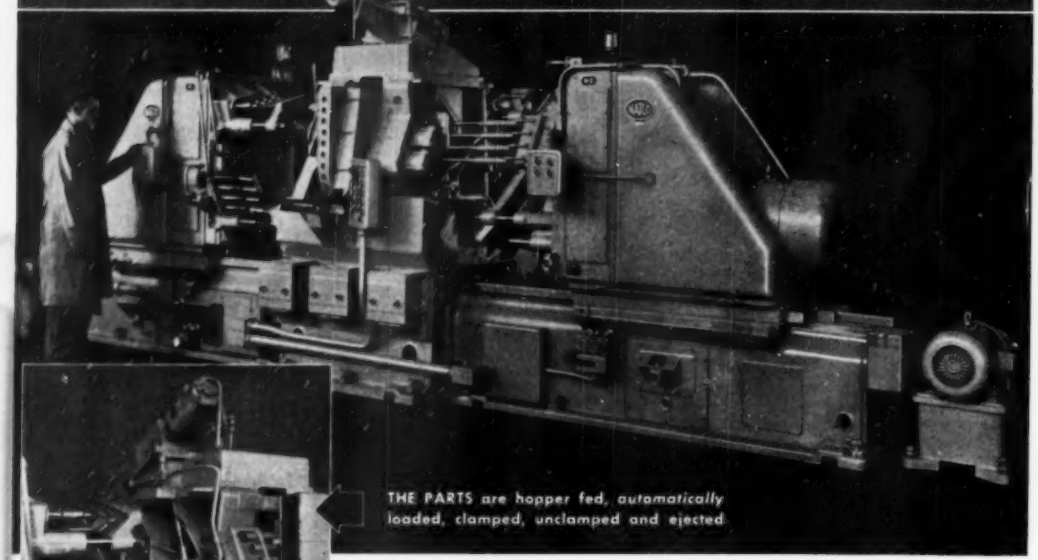
PARKER

PARKER RUST PROOF COMPANY
2196 East Milwaukee Ave.
Detroit 11, Michigan

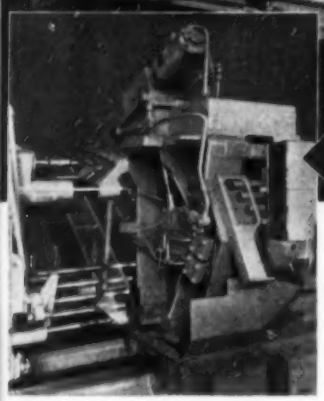
BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

575 PISTON PINS PER HOUR

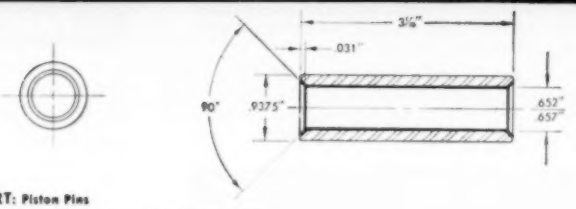
Drilled, Chamfered, Rough and Finish Reamed



THE PARTS are hopper fed, *automatically* loaded, clamped, unclamped and ejected



Chip conveyor attached to rear of fixture pedestal runs in under fixture and carries chips out of machine.



PART: Piston Pins

PRODUCTION: Approximately 575 parts per hour

OPERATIONS:

Position No. 1
Load four parts automatically

Position No. 2
Right and Left Hand Heads
Drill for .652" dia. 1/5 through

Position No. 3
Right and Left Hand Heads
Drill for .652" dia. 2/5 through and chamfer I.D.

Position No. 4
Right Hand Head
Drill for .652" dia. across center
Left Hand Head
Idle

Position No. 5
Right Hand Head
Rough ream through using accelerated spindles
Left Hand Head
Idle

Position No. 6
Right Hand Head
Idle
Left Hand Head
Ream through to .652/.657" dia. using accelerated spindles

Position No. 7
Unload four parts automatically

This is just one of many examples of the way NATCO machines contribute to higher production and lowered costs. Send us your drilling, boring, tapping and facing problems . . . our engineers have the solution.

Write today for NATCO "Success Story" No. 3 and investigate . . .

NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

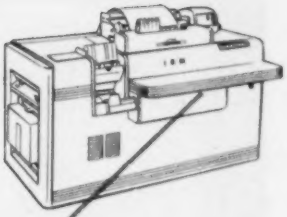
NATCO

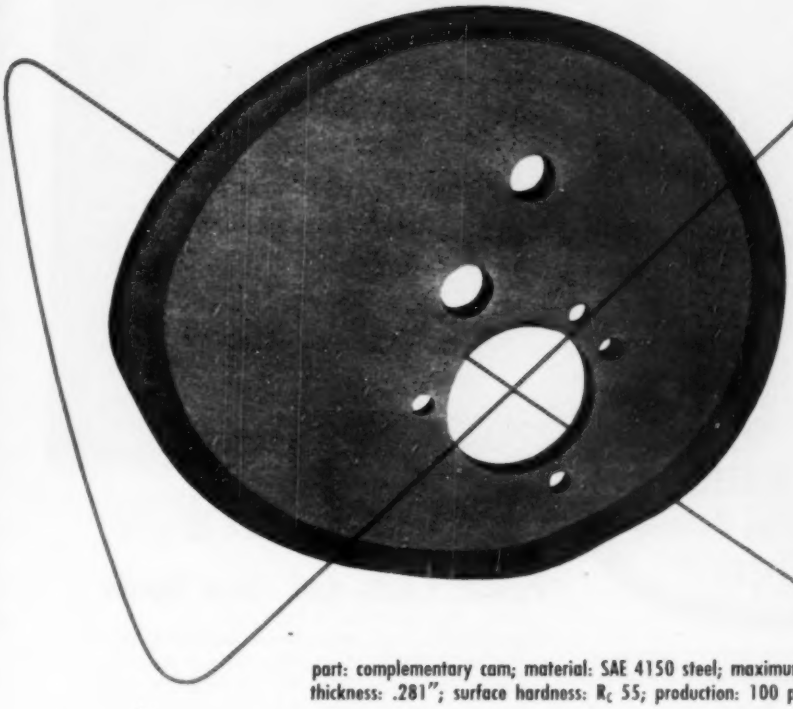
Call a Natco Field Engineer

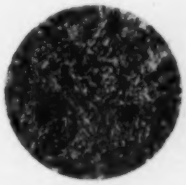
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

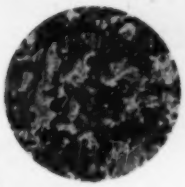
Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

flamatic hardening helps this IBM accounting machine to "think"





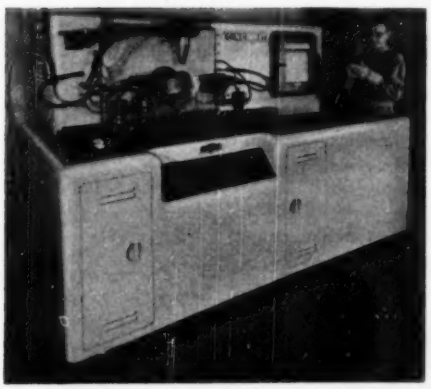




Above: structure at surface
Below: structure at transition zone.

part: complementary cam; material: SAE 4150 steel; maximum radius: 4"
thickness: .281"; surface hardness: R_C 55; production: 100 pieces/hour.

fH



flamatic hardening machine processing cams at International Business Machines Corp.

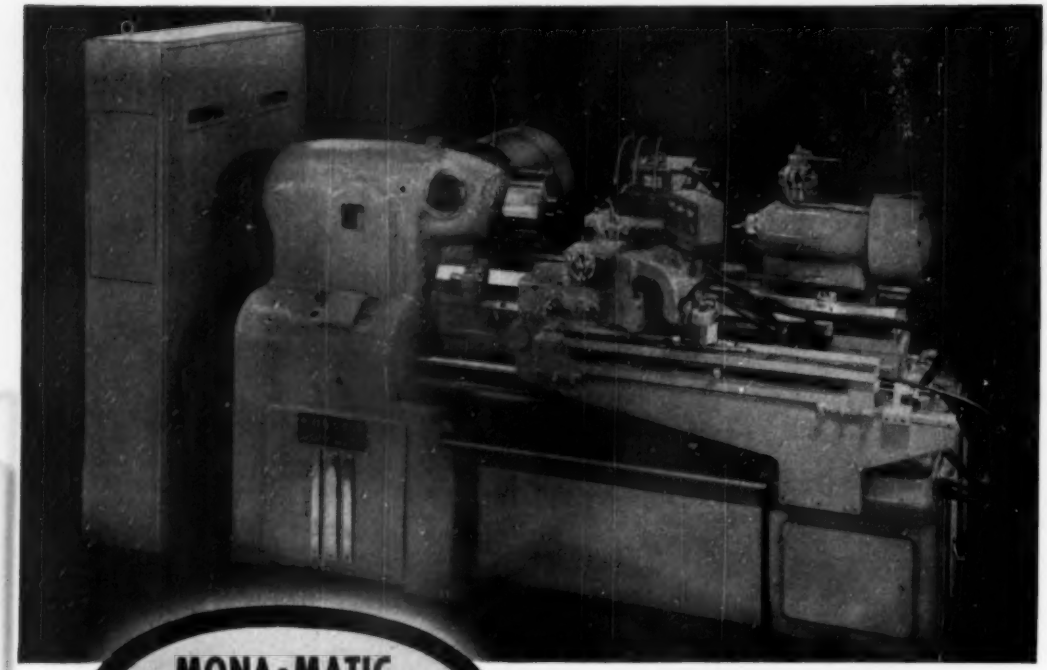
Look at the uniform depth of hardness on this cam—surface hardened on the Cincinnati Flamatic—and held flat within .001." Cams like this drive type bars which flash the answers to punch card problems on the IBM Model 403 accounting machine. These parts are flamatic hardened at the rate of 100/hour and used in the fully hardened condition tempered at 425°F. No subsequent corrective operations!

Operator simply loads part on spindle, pushes button, and Flamatic does the rest, heats part with high temperature flames so rapidly that heat is confined **to specified areas,** electronically controls surface temperature within plus or minus 5°F., deposits part in oil quench and conveys parts out of tank automatically . . . Gears, cams, etc., up to 18" OD or spindles up to 24" long are readily handled on standard Flamatic. Booklet of case histories entitled **"fH" may point the way** to making your product serve better or cost less. Write for it, or send a part print for recommendations.

flamatic

THE CINCINNATI MILLING MACHINE CO.

Cincinnati 9, Ohio, U.S.A. · CINCINNATI



MONA•MATIC or Multiple Tooling Methods ..WHICH?

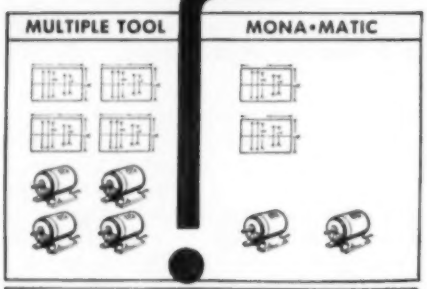
LET'S TALK

Power Costs and Floor Space

Would you like to cut your power consumption in half? And would you like to cut your floor space requirements in half, too—at the same time? It's just as simple as that.

On the typical steering knuckle job detailed at the left, one man, operating *two* Mona-Matics (total power requirements—40 hp) can outproduce, by 33⅓%, a battery of four multiple tool automatics (total power requirements—80 to 120 hp) requiring twice the floor space!

But bear in mind that cutting power and space requirements in half is not the whole story of the Mona-Matic's outstanding ability to cut your costs. You'll save on production time, on tooling costs, on setup time and on accuracy, too. For the full facts on how Monarch's famous Mona-Matics will outperform any ordinary multiple tool machining method, write for Bulletin 1804.



	Multiple Tool Automatics (Battery of Four)	Mona-Matics (Battery of Two)
Production	120/hour	160/hour
Cutting Tools	Cemented Carbide	Cemented Carbide
No. of Tools	40	4
Cost of Tools (including one replacement set)	$4220	$187
Setup Time	28-30 hours	46 minutes
Total Horsepower	80-120	40
Floor Space	150-200% more than Mona-Matics	
Subsequent Grinding Operations		50% less time than multiple tool

COMPARATIVE CASE STUDY

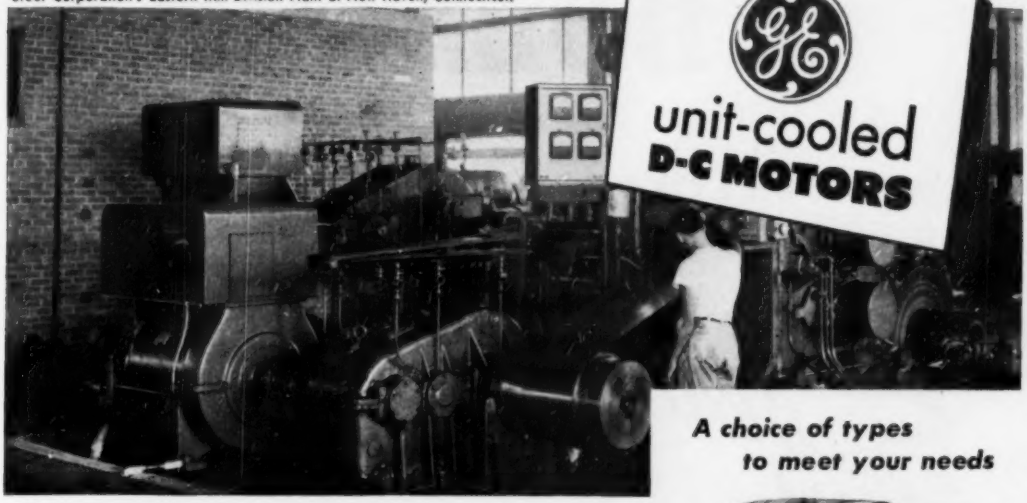
Part—Steering Knuckle, SAE 1045, turned section—3⅝" long, ¾" to 3" diameter

ACCURACY - ECONOMY - LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. Sidney, Ohio

The two G-E double-blower unit-cooled d-c motors shown at left, each rated 100 hp, operate the main drive and reel on a single-stand 2-high skin-pass mill, installed at Detroit Steel Corporation's Eastern Mill Division Plant at New Haven, Connecticut.



unit-cooled
D-C MOTORS

self-protected...to cut installation costs!

In dusty, dirty or oil-laden atmospheres—where open motors can't take it without special protection—you can cut installation time and costs to a minimum with General Electric totally-enclosed unit-cooled d-c motors. Motor and unit cooler, completely factory-assembled as a unit, come to you ready to install. They need no specially-built motor room, no piping, ductwork, coolant, filters or pressurized air supply. You simplify plant layout, save extra equipment cost!

These better-protected, better-cooled G-E motors—available in ratings from 15 to 200 hp—also

. . . **minimize inspection shutdowns!** Windings, brushes and brush rigging are kept clean at all times because harmful air-borne materials can't get into the motor's internal ventilating air.

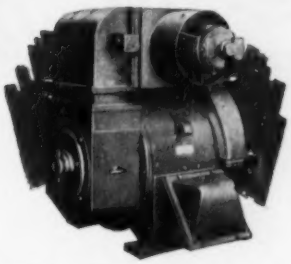
. . . **reduce power cost!** Because motor heat is rapidly dissipated, power consumption is less, especially in wide-range adjustable-speed motors.

. . . **simplify maintenance!** Large openings in the commutator end shield make it easy to get at commutator, brushes, and brush rigging.

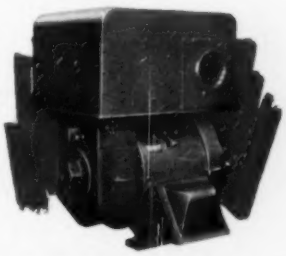
. . . **save mounting time!** Interchanging of motors to meet changing mill conditions takes less time because G-E totally-enclosed motors have the same mounting dimensions as G-E open motors of the same ratings.

Get the whole story! Ask your G-E representative how these sturdy, protected motors can help trim operating costs in *your* mill, or send for Bulletin GEA-4469. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

A choice of types to meet your needs



In single-blower type— for constant and adjustable speed operation at normal speed—unit cooler circulates internal air with a shaft-driven fan. External air is forced through alternate air passages by a separate motor-driven blower.



New double-blower type— can be operated continuously without harmful overheating, even at very low speeds. A single Tri-Clad® auxiliary induction motor drives both blowers, one for internal motor air, the other for external cooling air.

GENERAL ELECTRIC

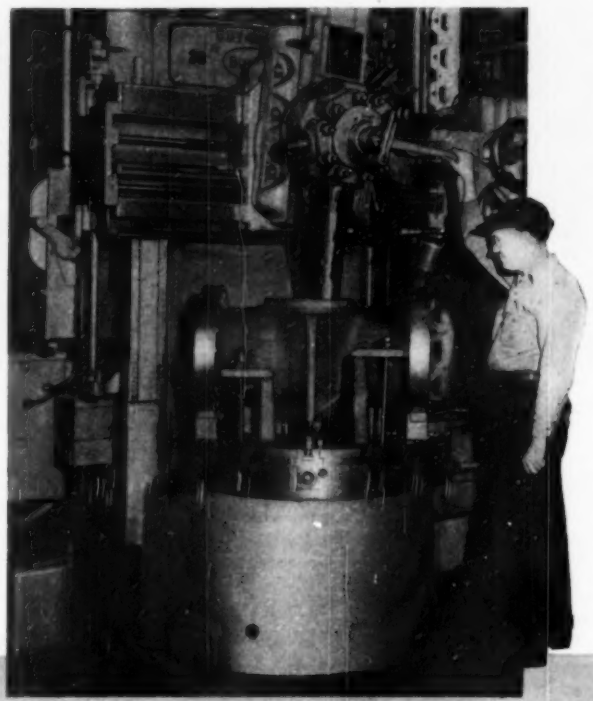
720-18

the BULLARD CUT MASTER

VERTICAL TURRET LATHE

BULLARD *Saves 2 Ways*

- 33-⅓% SAVED ON 3 OPERATIONS
- GRINDING OPERATION ELIMINATED



Bullard 36 inch Cut Master. Rigid enough to swing this large valve. Operations are taper bore, face flange and counterbore. 33-1/3 per cent time savings on three operations and because of the beautifully smooth finish, a grinding operation was eliminated.

Manufacturing Economies

This specifically illustrates the Bullard Cut Master adaptability to problem jobs. Naturally cumulative small savings in time, due to rapid and positive speed selection, limit stops for simplified dimensional duplication, centralized operating controls and high rate of rapid traversing add up to large savings on any work.

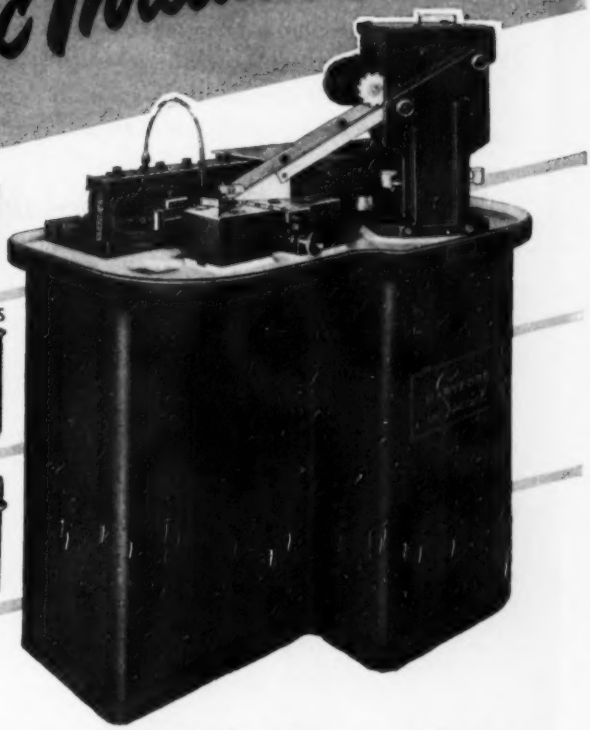
Also the rugged construction with large Timkin spindle bearings permits heavy feeds, thereby cutting time of operations. Rigid construction and screw feeds assure a high degree of machining accuracy resulting in minimum expense for spoiled work. All in all — Use Bullards for manufacturing Economies. Write for Cut Master Catalog XY-CVTL.

The Bullard Company, Bridgeport 2, Connecticut.

LOW COST — HIGH PRODUCTION

HARTFORD *Special*

Automatic Thread Roller



This Automatic Thread Roller is designed to solve standard and special thread rolling problems on small size screws from .086" to .190" in diameter with thread length capacity from ⅛" to 1½", rolling consistently to Class 3 Thread Fit. Careful engineering and rugged construction make it capable of continued high production runs with startling economy.

The "Hartford Special" Automatic Thread Roller incorporates such outstanding features as Completely Automatic Feed, Filtered Lubrication System, "Table Top" Working Level, Vibration-Free Operation, plus many more.

Our engineering staff is always available to help you work out your thread rolling problems. Write now for complete information.

HARTFORD *Special*

Automatic Drilling and Tapping Machinery • Swaging Machines
Die Polishing Machines • Contract Machine Work • Gears • Cams
"Super-Spacers" • "Four-Point" Milling Vises • "V-Block" Milling Fixtures

THE HARTFORD SPECIAL MACHINERY CO.
287 Homestead Ave., Hartford 5, Conn.

Please send me free Bulletin TR-100 describing your Automatic Thread Roller.

Name _____ Pos. _____

Company _____

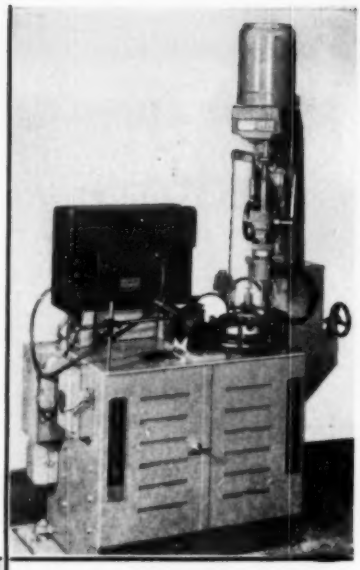
Address _____

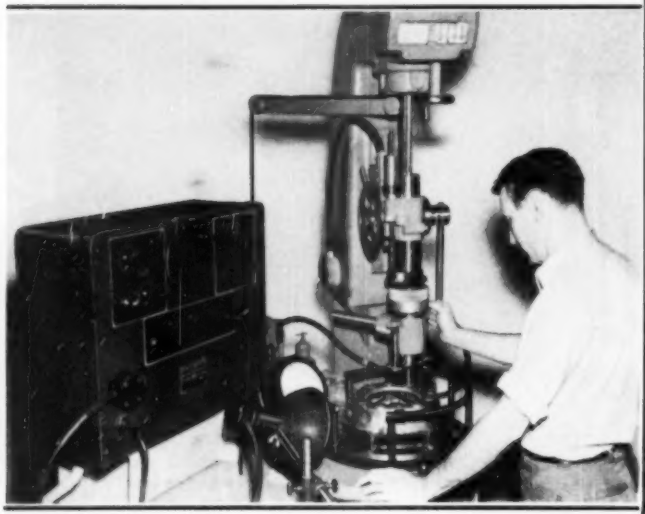
City _____ Zone _____ State _____

MACHINE BALANCES CLUTCH ASSEMBLIES!

Phenomenal speed and accuracy are achieved with the Gisholt machine which performs all four steps in the complete balancing operation as follows: (1) locates unbalance, (2) measures unbalance, (3) corrects unbalance, (4) checks balance. Designed especially for this work, the machine handles operations at the rate of 80 pieces per hour.

Gisholt ISV Dynetric Balancer





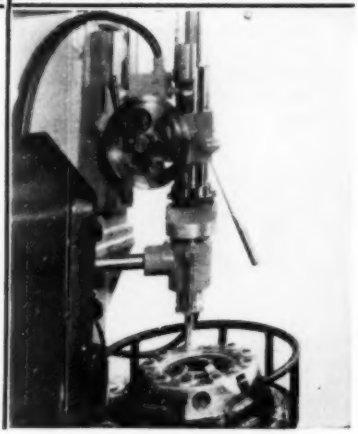
Saves handling time

With correction drill incorporated as a part of the machine, it is unnecessary to remove work piece from mounting for drilling. Handling time is cut to a minimum.

Corrections clearly indicated

Readings clearly show where and how much metal is to be removed in units of drill depth. All chips are automatically ejected so they cannot get caught in the clutch pressure springs.

Insures better service Whether it's in production or repair work, the balancing of clutch plate assemblies is of little avail unless it is done *accurately*. And here, again, the DYNETRIC principle provides the accuracy which makes Gisholt the unquestioned leader in the field of balancing. Full information on request.



GISHOLT MACHINE COMPANY
Beautiful Madison, Wisconsin

DYNETRIC BALANCERS — GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION
"DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES
BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

The woodpecker sits on a telephone pole
And tries very hard to tap out a hole.
Too bad he persists — his beak's much too dull,
For the pole is of steel — and he'll fracture his skull!
JOHN BATH CO. INC. · WORCESTER · MASS ·
B
I WILL KEEP MY TAPS SHARP
I WILL KEEP MY TAPS SHARP
WILL KEEP MY TAPS SH
ILL KEEP MY TAPS
ILL KEEP MY TAPS
Some folks (like Woody) do not use their brain.
Dull taps heat the metal and break under strain!
PRODUCTION
To get high production, just follow this rule —
Keep Bath taps sharpened — like any good tool!

INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

Ground from the solid after hardening, Bath taps are precision cutting tools designed for accurate work and long wear. They require the same care that is given any valuable cutting tool. Occasional sharpening in the flutes as well as on the chamfer will maintain the high degree of accuracy characteristic of Bath taps. You'll get higher production and fewer rejects.

Whether you use our stock sizes or custom designed taps for special jobs, we'll be glad to send you tap sharpening data.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

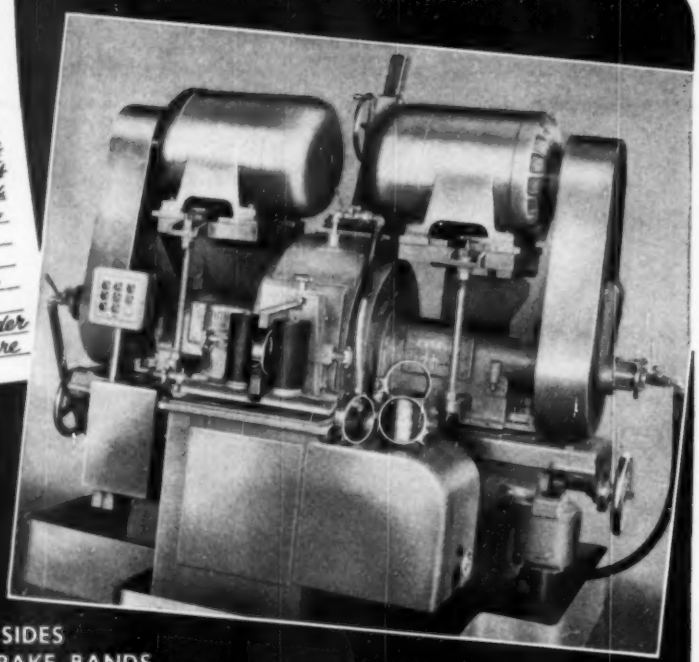
22 Grafton St., Worcester, Mass.

Double GARDNER-GRINDING

. . . the difference between ONE and TWO!

WORK DATA

Part *Transmission Brake Bands*
Material *Malleable Iron*
Operation *Grinding Parallel Sides of Bands*
Tolerances *.002"-.003" Flatness*
.002"-.003" Parallelism
.008"-.010" Uniformity
Stock Removal *.030" Max.*
Production *300 to 350 Pieces Per Hour*
Feed *Feed-Thru With Rubber Rolls*
Machine *No. 120A-26" Gardner Double Grinder With "Feed-Thru" Fixture*



GRINDING PARALLEL SIDES
OF TRANSMISSION BRAKE BANDS
IN ONE PASS THROUGH THE MACHINE

NOTE the close tolerances achieved on the transmission brake bands being ground on the Gardner No. 120A-26" Double Grinder pictured above. Yet . . . both sides are parallel ground at the same time . . . at the rate of 300 to 350 pieces per hour! Gardner Double Grinders, which grind TWO faces at one pass instead of ONE, are often the answer to your parallel-surfacing problems.

GARDNER-GRIND
Your Flat Surfaces

Ask for our DOUBLE-GRINDING Bulletin!

GARDNER MACHINE COMPANY

410 EAST GARDNER STREET . . . . BELOIT, WISCONSIN, U.S.A.

Save Mounting Time

With *Easy-to-Align* Magic-Grip SHEAVES

YOU CAN MOUNT a *Magic-Grip* sheave faster than any other sheave you can buy . . . and demount it just as fast. To mount, simply slide the sheave onto the shaft and tighten three screws. To demount, use the screws to break the grip of the tapered bushing and the sheave can be slid off easily.

You save time and eliminate the danger of damaged bearings and shafts from forcing and hammering. A hex socket wrench is the only tool needed and anyone can line up the sheave perfectly. Sizes 1 to 250 hp.

Most Complete V-belt Line

Get everything you need for your V-belt drives from one reliable source. *Texrope* offers the broadest line of V-belts, standard and variable-speed sheaves and speed changers plus the extra engineering skill that comes from more industrial V-belt installations in operation than any other manufacturer.

Get your copy of the 144 page *Texrope* Pre-Engineered Drive Manual from your A-C Authorized Dealer or Sales Office or write for Bulletin 20B6956. Also in Sweet's. A-2833

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Texrope and *Magic-Grip* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

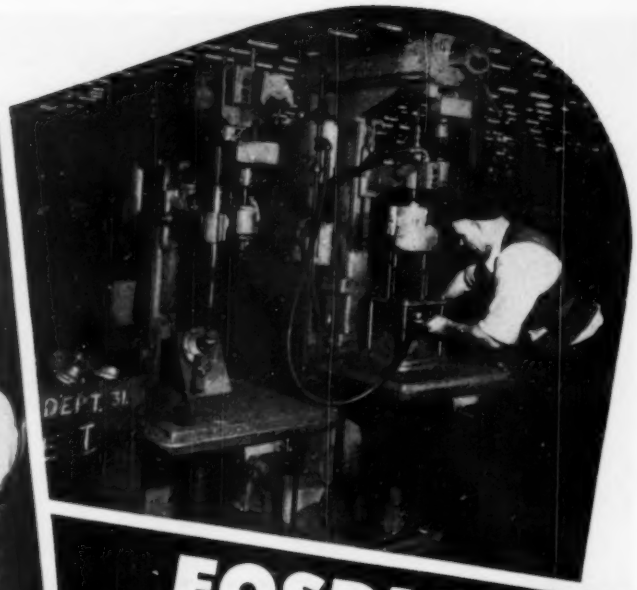
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS



FOSDICK
SENSITIVE AND UPRIGHT DRILLS
help boost production in automotive plant

● The accompanying illustrations show how a prominent automobile manufacturer uses Fosdick drills to keep production rolling.

The illustration at the top shows two Fosdick Sensitive Drills in operation. Note one of the machines is equipped with a drill head for drilling two holes simultaneously. The other machine in this photo shows the work mounted on an angular fixture for drilling an angular hole in the piece.

At the left top is a Sensitive drill with a drill head which is drilling two holes and reaming a third at the same time.

The Upright Fosdick Drill at bottom left is also equipped with a four spindle drill head for drilling all holes in one operation.

These are typical of the various kinds of operations being performed in hundreds of plants on Fosdick Sensitive and Upright Drills. If you have holes up to 1½" diameter you'll be interested in the Fosdick Sensitive and the Upright for larger diameters.

For complete details of design and construction Fosdick Upright Drill Bulletin UDA and Sensitive High Speed Drill Bulletin HSA is available.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

YOU CAN BE SURE.. IF IT'S
Westinghouse

Pumps and Compressors

Submerged in 6 ft. of Water..Open Motor Pumps Sump Dry

When water rose accidentally in a sump of an eastern plant, an open Life-Line motor was covered by six feet of water. Someone pressed the starter, and the Life-Line pumped the sump dry. Outside of being covered with a thick coating of mud and [illegible] motor [illegible]

Can your pumps use *MOTOR STAMINA* like this?

We certainly do not recommend open motors be operated under these conditions—in fact, we say DON'T DO IT! But this actual example illustrates the real stamina built into Life-Line motors—stamina resulting from improved materials and manufacturing methods.

Take the stator, for example. Coils are wound of Tufvar wire—wire you can pound with a sledge, tie into knots, without disturbing the insulation. Pear-shaped slots enable coils to be slipped into place without forcing. A fiber wedge closes top of slot, seals against dirt and moisture. Multiple dips and bakes in Thermoset varnish give the stator a tough flexible film, resistant to oil, moisture, acid and alkali. That's why, in the above example, there was no winding short-out—even under water.

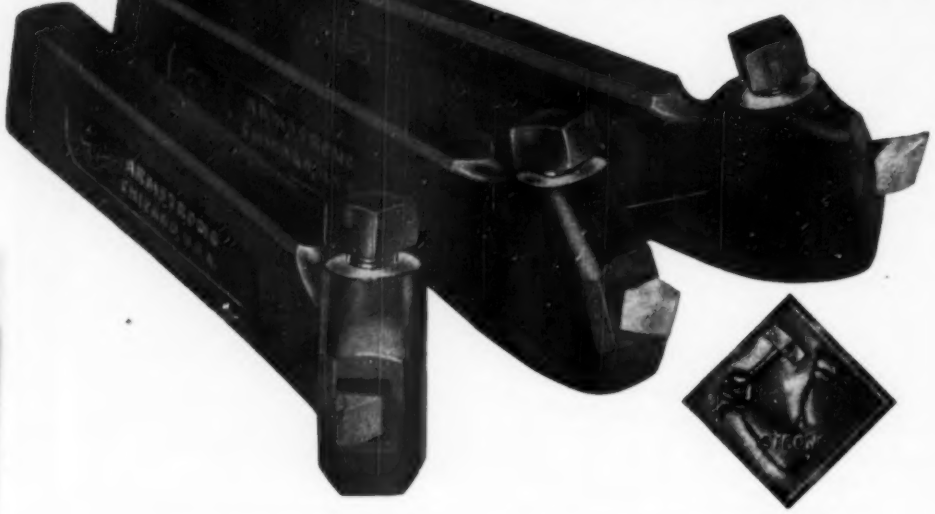
It costs no more to get this extra motor stamina. Simply specify Life-Line as the drive for your equipment. Ask your local Westinghouse representative for details and a copy of booklet B-3842, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-21576

If you figure LIFE-COSTS . . . you'll figure LIFE-LINE

Westinghouse
Life-Line
Motors
INDUSTRY'S LEADING MOTOR

ARMSTRONG



ARMSTRONG TOOL HOLDERS

are more efficient

It takes years of development, improvement and practical experience to create and perfect a line of tools. This has been the specialized work of ARMSTRONG, a contribution to machining efficiency which they have carried on continuously for 59 years.

Starting with the Armstrong Principle of inserted cutters in permanent tool shanks that "Saves: all Forging, 70% Grinding and 90% High Speed Steel," they created this unique method of tooling which has changed shop practice in over 96% of the machine shops and tool rooms. And, today, in a specially built plant, equipped with every modern facility and staffed with experts in each phase of tool making, this work goes on.

To you, as a tool user, here is always one safe principle—specify ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers, for turret lathes and screw machines. They are cataloged and stocked by all leading supply houses.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

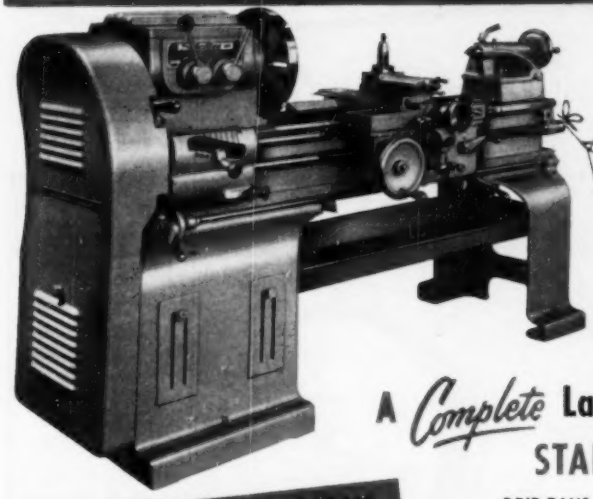
5215 W. ARMSTRONG AVE. **CHICAGO 30, U.S.A.**

Eastern Whse. & Sales Office: 199 Lafayette St., New York 12, N. Y.

Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, California

Sebastian 16" x 6' LATHE

8-SPEED GEARED HEAD



$1995
PLUS FREIGHT

"Best Buy" in the Medium-Price Field!

A *Complete* Lathe, including the Following STANDARD EQUIPMENT:

DRIP PANS • THREADING DEPTH STOP • TOOL POST
CENTERS • LEVELING SCREWS & PLATES • FACE PLATE
MOTOR & WIRING • REVERSING SWITCH • SPINDLE SLEEVE
DOG PLATE • WRENCHES • CABINET LEG

PRINCIPAL SPECIFICATIONS

Swing over bed	16½"
Width of bed	11¼"
Length of carriage	22¼"
Speed range, std. r.p.m.	20 to 487
Speed range, high r.p.m.	30 to 761
Number of thread and feed changes	57
Feed range	.002" — .259"
Thread range per inch	3 to 384
Horsepower of motor	2
Weight, crated	2525 lbs.

At the price featured above, this sturdy "King-made" 16" x 6' Sebastian Lathe is by all odds the best investment in the medium-price lathe field today.

Here's simple design, husky construction, sound engineering, a host of special features, in a general purpose Lathe with unusual ease of operation and low, LOW maintenance cost!

The Sebastian's many outstanding features include a powerful 8-speed geared head—Timken Bearings on all headstock shafts—reverse in apron for feeds—control handle on apron for longitudinal friction feed—accuracy .0005" at every point of alignment.

Sebastian general purpose Lathes are available in 12" and 20" swing, as well as the 16" shown here—also Gap, Clutch and Brake, and other special types.

Before deciding on any lathe, it will pay you to make a point-by-point and dollar-for-dollar comparison of the Sebastian Lathe with others in the medium-price field. A thorough investigation will convince you that the modern Sebastian is *your* "best buy"!

Send For These FREE CATALOGS!

Illustrated Sebastian Catalogs S-1 (Standard Lathes) and S-101 (Special Lathes—Gap, Clutch & Brake, etc.), give complete description and detailed specifications. See for yourself why the modern Sebastian is today's outstanding value!

Distributors in Principal Cities. Consult Your Classified Telephone Directory or Write Us.

American Steel Foundries

KING MACHINE TOOL DIVISION
CINCINNATI 29, OHIO
Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

THEY CAN TAKE IT...and DO!
...and still maintain accuracy

STANDARD *Dial Indicators*

Built to stand the knocks—often unavoidable

NEW-with Years of Service Ahead

REGULAR AGD SERIES

AGD SPECIFICATIONS THROUGHOUT

Made in 22 models including 4 dial diameters, 7 different graduations. Also 90° models (stem perpendicular to back). Long Range and Long Stem types.

***Decimatic* SERIES**

AGD SPECIFICATIONS except Range and Marking

For especially fine checking, extra high repeatability and accuracy. Marked in decimals. No whip of hand. 16 models.

This One Was New... *Years Ago*-

Still Serviceable

Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.

SEE US AT THE ASTE SHOW — BOOTH 932

Outstanding Reason for the Durability Built into Standard Indicators is the

SHOCKPROOF MECHANISM

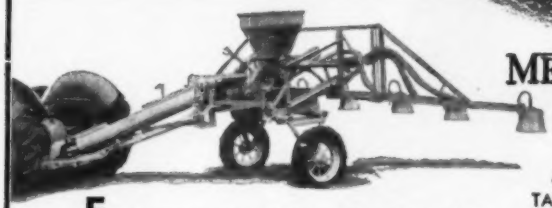
Proved by experience to prolong instrument life greatly, Standard's Shockproof Mechanism protects internal parts right from the spindle on. Furnished regularly in most models, not treated as an optional extra. Standard Indicators give longer, trouble-free life, need fewer repairs, are dependable. These facts add up to "Greater Economy."

STANDARD GAGE CO., Inc., *Poughkeepsie, N.Y.*

Your keenest competitor knows—

That no matter how well established his business may be, *nothing can damage it more than better equipment and better methods in the hands of an aggressive rival!*

He also knows that unless YOUR equipment and methods are "up-to-the-minute", YOU cannot continue to sell YOUR products at competitive prices.



MESSINGER Mfg. Company

SINCE 1857

For instance, the alert management of the Messinger Mfg. Co., Tatamy, Pa., knows the competitive advantages of owning top-flight production equipment. This company, famous for over 90 years' experience in producing agricultural implements, recently installed 3 new Jones & Lamson Universal Turret Lathes to replace 6 *apparently* satisfactory machines.

These three up-to-the-minute turret lathes immediately began paying Messinger handsome returns on their investment, by removing metal faster with *repetitive* accuracy.

Money savings, based on direct costs alone, completely paid for the machines in LESS THAN ONE YEAR—and now, *THE ENTIRE WEIGHT OF THIS PRODUCTION ECONOMY IS STRENGTHENING THEIR COMPETITIVE POSITION.*

ARE *YOU* EQUIPPED TO *YOUR* BEST ADVANTAGE? Get a free check-up on your present operations. *Write to our PRODUCTION RESEARCH DEPARTMENT for this service.*

Photo Courtesy [illegible] Mfg. Co., Tatamy, Pa.

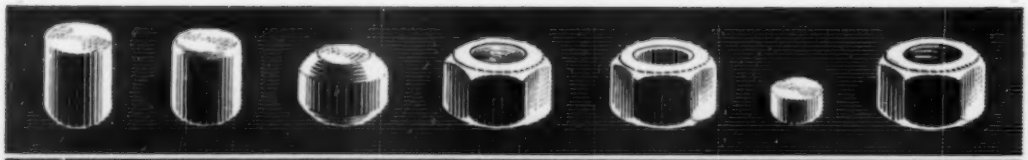
Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies

JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835



Inviting your inspection

BECAUSE Youngstown "Scrapless" Nut Wire is designed for modern cold-heading operations, it invites your critical tests. You'll find its sizing accurate and its composition correct. It measures up on chemical and metallurgical checks for analysis and microexaminations.

Available in various compositions, including AISI standard as well as special sulphurized steels.

QUALITY YOUNGSTOWN SERVICE

Youngstown

"SCRAPLESS" NUT WIRE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

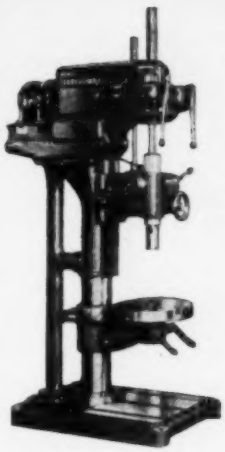
General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

WIRE · COLD FINISHED CARBON AND ALLOY BARS · PIPE AND TUBULAR PRODUCTS · CONDUIT · RODS · SHEETS · PLATES · BARS · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · RAILROAD TRACK SPIKES.

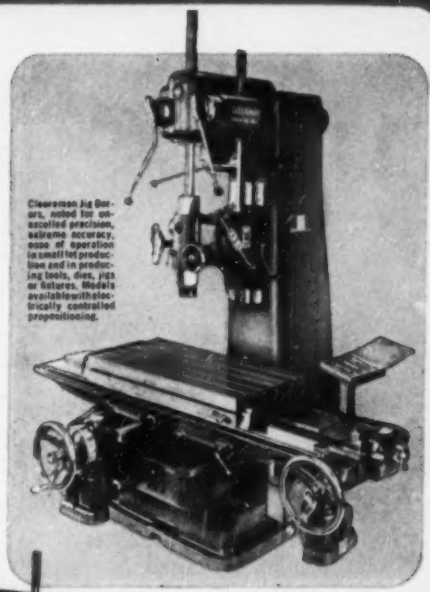
THE CLEEREMAN LINE

OF PRECISION JIG BORERS and DRILLING MACHINES

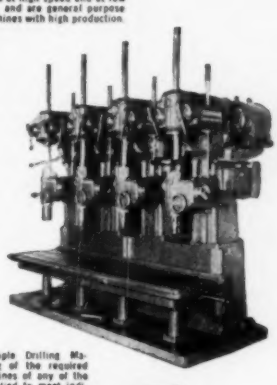


Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost, and are general purpose machines with high production.

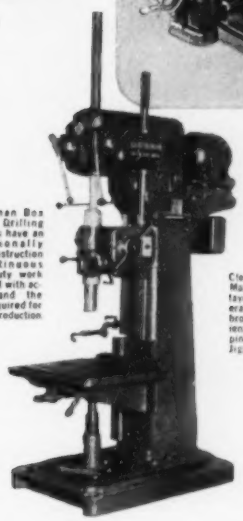
Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.



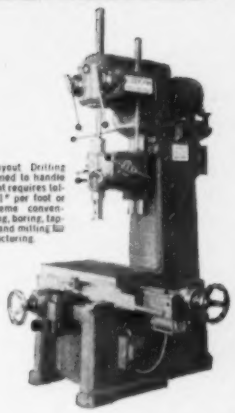
Cleereman Jig Borers, noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled preselecting.



Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.



Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.



Cleereman Layout Drilling Machine designed to handle layout work that requires tolerances of .001" per foot or broader. Extreme convenience for drilling, boring, tapping, reaming and milling for jigless manufacturing.

BRYANT Machinery & Engineering Company

General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES

HARDINGE
ELMIRA, N.Y.

LATHE and MILLING Machines

Two Essentials for Tool Rooms

Modern high speed precision tool room work calls for companion units that are rugged, with an abundance of power over the entire speed range in order to take on all jobs to their full capacity.

Hardinge TL 5 Lathe and TM-UM Milling Machines, with interchangeable attachments, are the units you should specify for your tool room. These low-cost, precision machines give you important advantages:

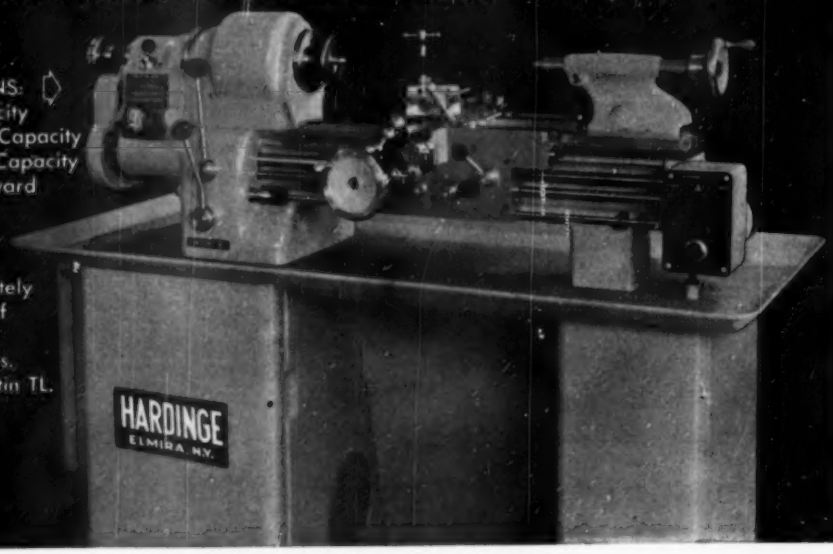
First — Large machine capacity is freed and money saved on original machine investment. Hardinge units take over a wide variety of work that cannot be handled economically by larger, expensive machines.

Second—*Tool room costs are reduced and results improved. Hardinge units speed up operations on the smaller work and give better results in accuracy and finish.*

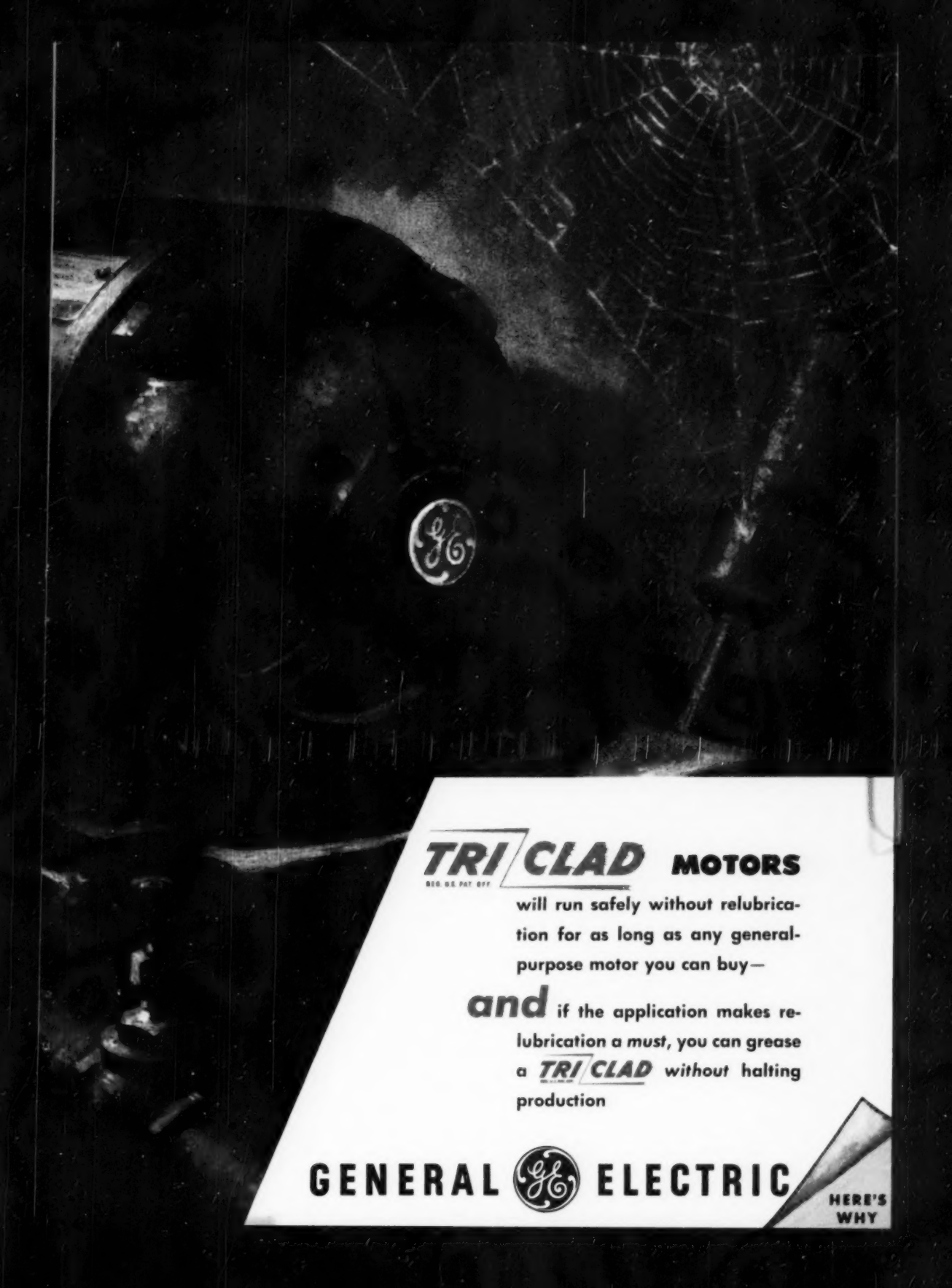
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

TM-UM MILLING MACHINE SPECIFICATIONS:
1" through collet capacity for both cutter and dividing head spindles; 11½" longitudinal, 13¼" vertical, 5½" transverse travel; 8 speeds forward and reverse. Write for Bulletin TM-UM.

TL 5 LATHE SPECIFICATIONS:
1" Collet Capacity
6" Step Chuck Capacity
5" Jaw Chuck Capacity
16 Speeds Forward & Reverse.
Independent electric power drive for infinitely variable rate of carriage and cross-slide feeds.
Write for Bulletin TL.



SEE THESE MACHINES IN ACTION—Space 835 A.S.T.E. Exposition


TRI CLAD MOTORS
REG. U.S. PAT. OFF.
will run safely without relubrication for as long as any general-purpose motor you can buy—
and if the application makes relubrication a must, you can grease a TRI CLAD without halting production
GENERAL ELECTRIC
HERE'S WHY

TRI CLAD MOTORS will run safely without relubrication for as long as any general-purpose motor you can buy—

Tri-Clad extra lubrication "protection" can save you money because:

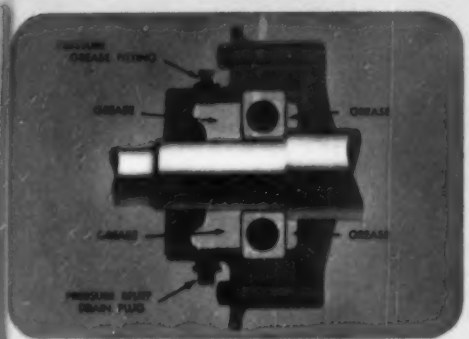
1. Tri-Clad's oversize grease reservoir and the heaviest standard-service bearings mean you do not have to bother with greasing between motor check-ups.

2. When relubrication is needed on those tough applications, you can grease a Tri-Clad without interrupting production-line operations.

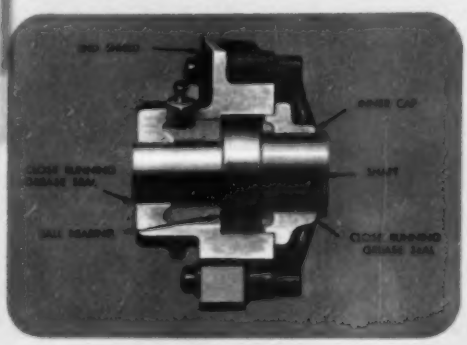
Tri-Clads are grease-gun easy to lubricate *on the job*. Moreover, a Tri-Clad motor will run safely where an ordinary motor would fail. Chances are you'll be spared the cost of a "special" motor.

YOU BE THE JUDGE! The best way to prove to yourself that Tri-Clad gives you the most for your motor dollar is to contact your local G-E office. Tri-Clad stocks are complete. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

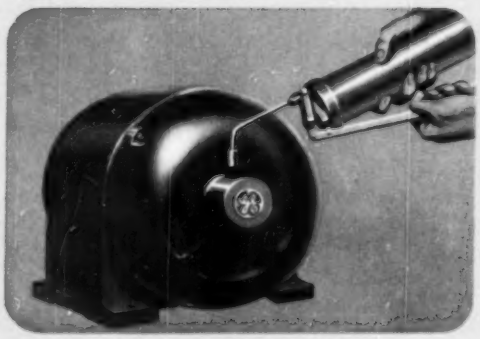
1 **EXTRA BEARING PROTECTION** — Tri-Clad gives you extra bearing protection because heaviest standard-service bearings are carefully selected to withstand severe loads for long periods.



2 **EXTRA GREASE** — Four times the ordinary amount of grease is packed into the large Tri-Clad grease reservoir. Since bearing life depends on grease, this means that Tri-Clad motors will run safely for years — for as long as any general-purpose motor you can buy.



3 **SEALED-IN BEARINGS** — Bearings and grease are completely sealed in a cast housing with long running seals for extra protection from dirt, dust, and lubricant leakage.



4 **PRESSURE-RELIEF GREASING** — An efficient system of pressure-relief lubrication (with standard fittings) enables a Tri-Clad motor to be quickly and easily greased on the job when and if it's needed.

GENERAL ELECTRIC

752-3

If you need

PRECISION GROUND SURFACES

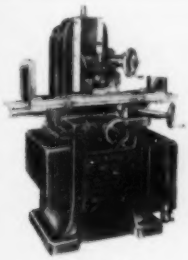
See the complete line of Grand Rapids Grinders

Tool room types — production types

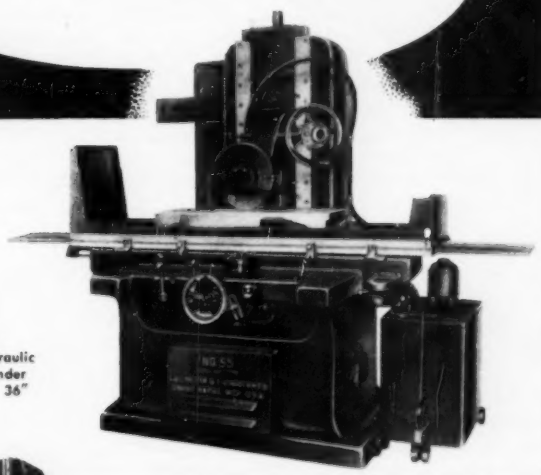
In small job shops and in America's largest industrial plants, more and more Grand Rapids Grinders are delivering tool room accuracy with micro-inch finish at production speeds. Your inquiry about surface grinders or cutter grinders, tap grinders, drill grinders or combinations, will receive prompt attention.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.

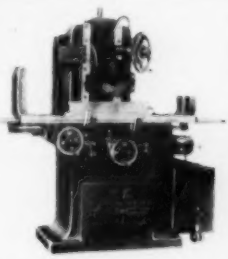
No. 20
Grand Rapids Hand Feed Surface Grinder
Size 6" x 10" x 18"



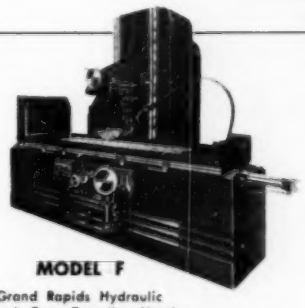
No. 25
Grand Rapids Hydraulic Feed Surface Grinder
Size 6" x 10" x 18"



No. 55
Grand Rapids Hydraulic Feed Surface Grinder
Size 12" x 17" x 36"

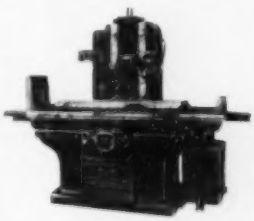


No. 35
Grand Rapids Hydraulic Feed Surface Grinder
Size 8" x 12" x 24"



MODEL F
Grand Rapids Hydraulic Feed, Cross Traveling Head Surface Grinder
Size 16" x 25" x 48" to 24" x 25" x 96"

GRAND RAPIDS GRINDERS



No. 65
Grand Rapids Hydraulic Feed Surface Grinder
Size 12" x 17" x 48"

HENDEY
No. 2
GENERAL
PURPOSE
LATHE

Let's talk 'PRICE'

A good lathe costs money. The new Hendey No. 2 General Purpose Lathe is not an exception, but is an exceptional value. This lathe is an entirely new concept. It replaces the famous Hendey Cone Head Lathe, but retains all the facility—with a single lever belt shifter. It has eight speeds, but no expensive geared head. A unique feature eliminates belt pull on the spindle. There are 48 thread and feed changes, and graduations permit spindle indexing for cutting multiple threads. The Bed Ways, both Carriage and Tailstock, are hardened and precision ground. Here's a lot of lathe for the money—the price will please. Write today for details and catalog.

PRINCIPAL DIMENSIONS

Rated size	14"
Swing over ways	16 3/16"
Swing over cross slide	10 1/4"
Spindle bearings—Preloaded super-precision roller bearings	
Spindle nose	L-1 taper nose
Hole through spindle	1 1/2"
Range of spindle speeds	30 to 1142 R.P.M.
Carriage bearings on ways	21 1/2"
Width and length of cross slide	7"
Compound rest travel	4"
No. of thread and feed changes	48
Range of thread cutting	1 1/2 to 92

THE *hendey* MACHINE COMPANY

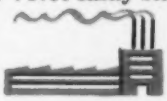
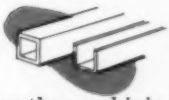
MAIN OFFICE & PLANT: TORRINGTON, CONN.

BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

No Dice

Squawks from his salesmen had this chair manufacturer bothered. These chairs have no sales appeal . . . they're too heavy! He wanted to make an all-magnesium model, but his shop manager said, "No dice we don't know how to handle magnesium". Not easily stalled, he contacted light-metal headquarters, Aluminum Company of America.  There he found that simple procedures make using magnesium easy*. Magnesium extrusions,  he learned, were a natural for his chair frames. They eliminate costly machining. So he decided to join the hundreds of manufacturers who whisk through a million pounds of magnesium every month. Now, made of American Magnesium Extrusions, his chairs are lighter . . . . . his costs are lower. His salesmen are making competition take a back seat.

*No change in insurance rates.

These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium Products, 2106C Gulf Bldg., Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO® PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Walker-Turner *design* makes this *new* 16" BAND SAW a *cost-cutting* machine!

. . . designed to cut metal-cutting costs.

NEW POWER FEED protects blade against distortion. Motor driven, it maintains a pre-set loading pressure. Easily adjusted for blade condition and various types of material.

walker-turner

● You would expect this Walker-Turner machine to be efficient. But you'd have to *operate it*, in your own plant, to appreciate how quickly, accurately and economically this new 16" Band Saw cuts sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions, or molded plastics.

Secret of its high operating efficiency is Walker-Turner *unit design*. Main column of the machine, for example, supports the two cast iron wheel housings, which in turn carry the wheel bearings and other elements of the saw.

Wheel housings are fitted with strong, lightweight covers that completely shield saw blades and wheels. Design improvements in upper and lower blade guides give maximum support to both wide and narrow saw blades. Easily adjusted roller provides back support on the upper guide. Every basic part is completely functional!

Find out more about Walker-Turner designing . . . how it can help you to increase production and lower machining costs. See your local authorized Walker-Turner dealer or mail coupon for catalog describing the complete Walker-Turner money-saving line.

Walker-Turner Division, Kearney & Trecker Corp.
Dept. AM2, Plainfield, N. J., U. S. A.

Please send me a copy of the new Walker-Turner Catalog.

Name_____

Firm_____

City_____ Zone____ State_____

KEARNEY & TRECKER
MILWAUKEE

WALKER-TURNER DIVISION
PLAINFIELD, NEW JERSEY

Why Operators Like Cimcool

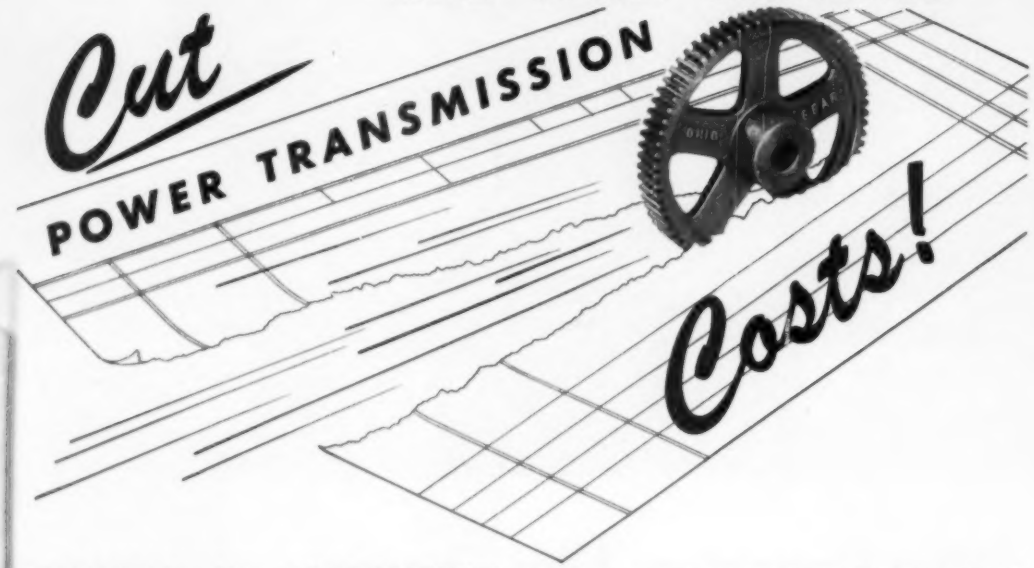
♥ This revolutionary cutting fluid is tops with metal cutting operators because Cimcool® makes jobs better. And no wonder! Cimcool is superior to old-fashioned coolants because it is a *chemical emulsion* incorporating a radically new and different principle in cutting fluids.

♥ Operators say Cimcool is the biggest working improvement in years because "it's clean . . . doesn't soil hands or clothing . . . can't smoke . . . can't burn . . . virtually eliminates rancidity and foul odors . . . leaves no hazardous slippery film on hands, machine, work or floor . . . contains no skin irritants . . . and cools so fast that tools and chips actually stay cool to the touch."

♥ You'll get better production when you make jobs better with Cimcool. Let a demonstration in one of your own machines convince you. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, send for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

OHIO STOCK GEARS
AND SPEED REDUCERS



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Power transmission cost is one place you can make solid savings. Use Ohio Stock Gears and Speed Reducers for the machines you build or maintain and you win these three cost-cutting advantages:

1. They *are* stock, saving the extra cost of "specials."
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3. Replacements are quicker, cost less and eliminate expensive down time.

Ohio Stock Gears are available in spur, helical, bevel, worm and worm gear types, in pitch diameters from 24 to 6 and in mitre type from 24 to 4.

Ohio Stock Reducers include ratios from 10-1 to 3200-1; single reduction capacities from 1/6 HP to 10 HP; double reduction capacities from 25 inch pounds to 6000 inch pounds torque.

Put these Ohio Stock Gear and Speed Reducer advantages to work on the machines you design and operate. Our nearest distributor will be glad to help you.

OHIO GEARS

I'VE ONLY BEEN HERE 5 DAYS, BUT I'M TURNING IN MY READING GLASS.
WHY? DID YOU NEED A READING GLASS ON YOUR LAST JOB?
WELL, THEY HAD SO MANY DIFFERENT MAKES OF CUTTING TOOLS, SO POORLY MARKED, THAT I COULD NEVER GET THE SAME KIND TWICE WITHOUT USING A READING GLASS.
NOT HERE! WE STANDARDIZE. THE SHIELD BRAND IS ON EVERY CUTTING TOOL WE USE ··· BIG ENOUGH TO SEE ··· EASILY RECOGNIZED. AND WE MAKE A LOT OF SAVINGS BY STANDARDIZING ··· PLUS UNINTERRUPTED PRODUCTION. ALL THESE THINGS HELP TOWARD OUR PRODUCTION BONUS, TOO

Features of Standard Shield Brand Tools

1. Foremost Quality—In design—workmanship—material. **2. Complete Line**—One reliable source of supply for drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools. **3. Complete Service Stock**—Over 10,000 items regularly carried in factory stock. **4. Nation-wide Availability**—Stocked and supplied by leading Mill Supply Distributors coast to coast. **5. Men Who Know Their Business**—Our service staff has the advantage of 68 years of accumulated experience in solving tough problems.

Standardize on Shield Brand Tools for uniform cost reducing performance

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THE STANDARD LINE: *Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

Comfortable Protection

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AO recommends the 5X163 glove illustrated for protection on gas welding and the heaviest amperage electric welding. Hands and fingers have the freedom and comfort they need for the job because the chrome-tanned leather, while made to withstand hard wear, is soft and flexible. Your nearest AO Safety Products Representative can supply you.

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- Chrome tanned split horsehide
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with 14' 4" clearance

It's massive— It's powerful— It's portable

7 OUTSTANDING FACTS

1—Most powerful Radial ever built.
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THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
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Radials 7½" dia. col. 21" arm to 56" dia. col. 12' arm
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Equal Efficiency of Every Unit Makes the Balanced Machine

To our knowledge the largest and most powerful Radial Drill ever built, this Cincinnati Super Service Master Radial Drill, with a 40 horsepower motor, is being used as a portable machine on very large and heavy work.

This massive machine, built like a watch, handles easily, and gives continuous, trouble-free service on the heaviest of jobs.

Write for Bulletin R-22 or consult our Engineering Department on your drilling problems.

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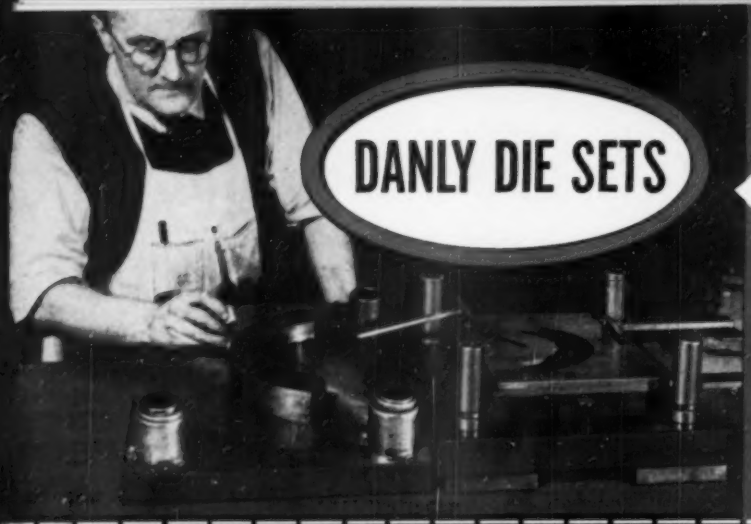
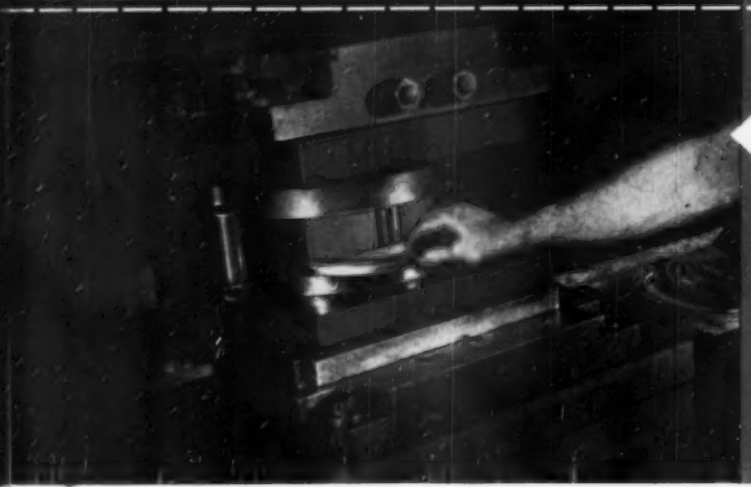


DANLY DIE SETS

less time

IN THE DIE SHOP

Reliable Danly precision makes die assembly quicker and easier ... possible reworking of die sets to make them square and true is eliminated. Precision leader pin and bushing fits assure accurate die closure and protect delicate die components. Danly Die Sets mean better dies in less time!



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ON THE PRODUCTION LINE

Hardened, ground and lapped leader pins resist wear . . . accurate die relationship minimizes punch shearing and die breakage. Precision Danly Die Sets justify die maker's precision in the press setup, preventing premature die wear. Danly Die Sets mean more parts per grind!

SEE DANLY AT THE A. S. T. E. SHOW BOOTH 850

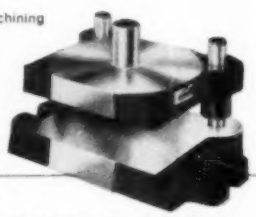
. . . featuring Danly Precision Die Sets and Tool, Die and Gage Makers' Supplies

Danly precision makes every Danly Die Set a reliable foundation for the finest die work. And in addition to the performance advantages they assure, Danly Die Sets are quickly available, too, from a nation-wide system of completely stocked assembly branches.

Large or small, standard or special, there's a Danly Die Set to meet every tooling need. Just contact your nearest Danly branch for fastest delivery of the best in die sets.

WRITE FOR FREE BULLETIN

. . . and see how Danly's special die set machining service can help reduce your costs.



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OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

SPOT NEWS OF METALWORKING

Lockheed Aircraft will spend $2 million on factory modernization program, including installation of 8000-ton hydraulic press and other equipment to handle heavier-gage metal and much larger sheet sizes. Because of massive nature of new equipment, machinery will be installed first, with building to be constructed over machines later. Program is to keep pace with design development of larger aircraft with increasingly higher speeds.

Younger workers at midwestern metalworking concern wish more pay rather than pensions in proposed contract revision with management. St. Louis company has settled with employees for six paid holidays and broadened insurance program instead of pensions.

Ford's new engines will be produced at Rouge in the revamped building formerly housing aircraft engine manufacture. Renovation will begin next October, with timetable calling for production of engines to start a year thereafter.

A $750,000 lift truck plant will be built in Australia by Hyster Co. New plant will make bid for business in South Africa and other sterling area markets as well as in Australia.

Group of French machine tool builders is employing U.S. engineering firm to redesign machines especially for American market, hoping to compete against U.S. companies in this country.

Farm implement sales this year are expected to vary with seasonal needs of farmers instead of remaining fairly constant throughout the year (see story on page 132).

Assembly of mechanical-handling equipment in Canada will be started by Steel & Co., Ltd., Sunderland, England. Company has Canadian orders for $5 million which will keep Sunderland factory in full production for many months.

New steel fabricating plant built in Alabama by Ohio company will pay for itself in one year by savings on materials and parts formerly hauled from Ohio to Alabama.

Efforts to clear way for construction of overhead belt conveyor to carry iron ore and coal between Lorain-Cleveland and the Youngstown-Pittsburgh districts are to be intensified by Riverlake Belt Conveyor Lines, Inc., Akron, Ohio. All engineering work has been done by Riverlake Engineering Council, comprised of companies which will furnish equipment for this 103-mile overhead conveyor.

Rapidly increasing demand for magnesium sheet in aircraft, guided missiles, rockets, radar and other national security requirements is largely responsible for new magnesium sheet rolling mill to be established by Aluminum Co. of America at New Kensington, Pa.

Titanium is being examined by jet engine builders as candidate for use in discs and compressor blades of turbojet engine compressors. Titanium ingots as large as 500 lb have been produced experimentally by midwest company. Even larger ingots are promised in near future. Materials experts are viewing titanium as probable basic airframe structural metal within 5-10 years, both for piloted aircraft and missiles.

Schneider & Co. will spend $8.6 million, including $1.9 million with ECA funds for machinery and other production equipment in United States, in a two-year modernization program at its French factories. Some $1.7 million will go for American machine tools and accessories and $198,000 for "metalworking and industrial machinery." Most of franc financing will come from company's own resources.

Gaging Metalworking

Machine tool orders in January soared to $29,500,000, according to preliminary estimates. That represents the largest single month's bookings in almost three and one-half years. The January figure was 99.7 on the index of the National Machine Tool Builders' Association. The last time that this figure was exceeded was in August, 1946, with 99.9.

January showed a notable climb from December, which stood on the index at 82.5. It is believed that the biggest single factor in January's spectacular performance was automotive retooling orders, as predicted previously in this column. What is more, February and March both appear to be excellent months, though neither is likely to touch January.

Export Demand Heavy

Foreign business in January added up to 26.8 percent of total new orders. And demand from export sources should continue very active during the entire first quarter. Shipments tumbled in January to 52.4 as against 75.7 in December. Some drop in that period is not unexpected, but the figures reveal a decline of unusual severity. Dollar shipments in January were about $15.5 million. Backlog of the industry at the start of February was sufficient to insure operations at the January shipment rate for almost six months.

Not in years have automobile companies spent so much money on new machine tools. More outpouring of machine tool orders from Detroit is looked for through the first half of the year. Special-purpose, high-production machines are doing exceptionally well.

Locomotive Business Improves

Orders for diesel-electric locomotives and for railroad cars are much better. One builder of locomotives says that he has booked as much business in two months as he expected to get in the January-June period. Railroads have been stimulated in their cost-saving programs by the adoption of the 40-hr week.

In contrast to the healthy situation in the locomotive field, bus production is very poor. Manufacturers do not anticipate much improvement in production the next few months.

Builders of large turbines are feeling better as a large number of good inquiries are nearing the closing stage. Turbine orders have been scarce for many months, though manufacturers have had plenty of back orders to live on. Fresh business which should be placed the next 60 days probably will be enough to insure full capacity operations of turbine makers through 1951.

Fractional Motors Going Strong

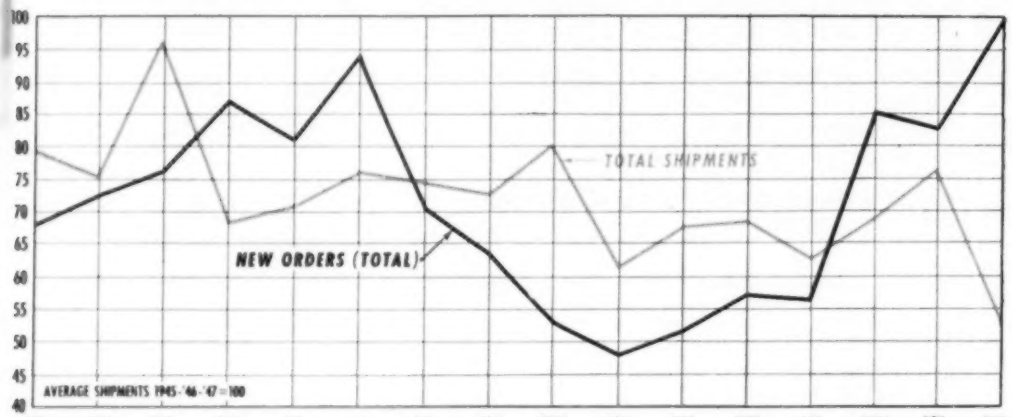
Fractional horsepower motors are being produced at a much greater clip than manufacturers had expected. Orders from the household appliance field have been beyond anticipations. Some factories are running overtime to try to catch up with delivery demands of customers. Output at the current rate should continue well toward midyear.

In the small and medium motor business, orders are very good, too. Pump and compressor makers, as well as machine tool builders, are now better sources of orders than they were.

Metalworking Depends on Coal

What happens in Metalworking depends upon what happens in coal.

Machine Tool Orders Zoom Up Toward New High in January

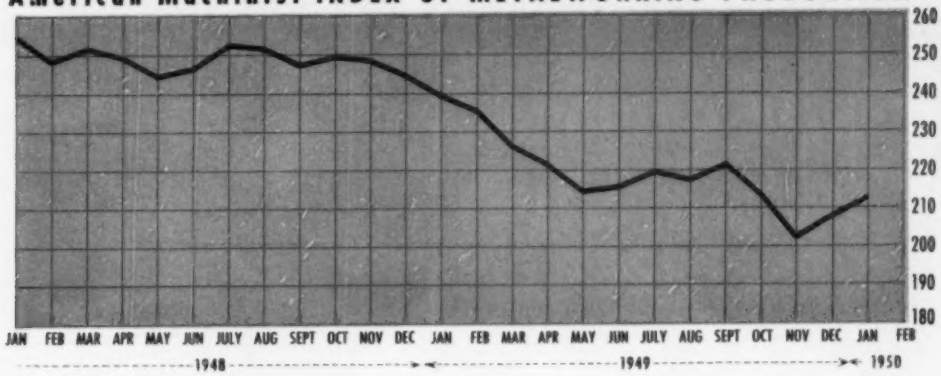


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN
New Orders (Total)	87.0	80.9	93.5	70.1	63.7	53.6	48.0	51.5	57.7	56.8	84.3	82.5	p99.7
Foreign Orders (Incl. in Total)	21.9	26.5	22.3	23.1	15.9	15.7	14.0	18.8	13.7	13.7	17.1	22.4	p26.8
Shipments (Total)	68.8	70.3	75.8	74.9	72.8	79.0	60.7	67.3	67.6	62.3	68.0	75.7	p52.4

Data: NMTBA

p—preliminary figures

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Jan. 1950 (Preliminary)	213	201	243	188	218	232
Dec. 1949 (revised)	210	194	238	185	216	232
Jan. 1948	255	261	292	199	261	272

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 13.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

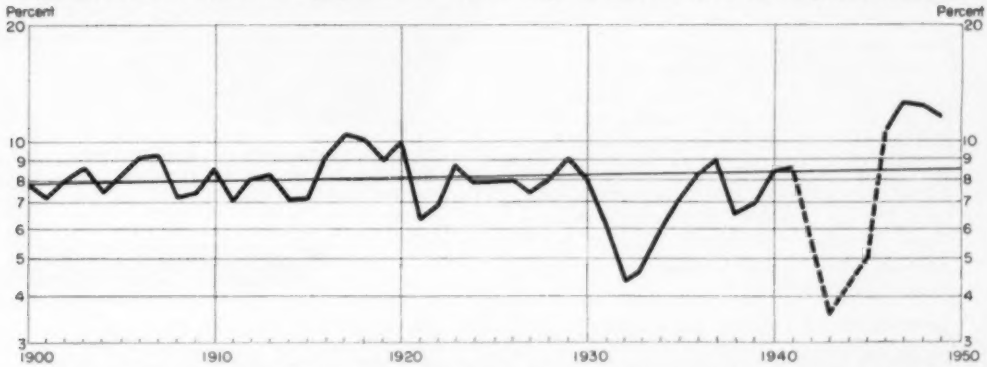
The coal strike, at this writing, is gradually bringing on a paralysis in metalworking operations principally because of growing steel shortages.

If the coal strike should end abruptly around March 1, production in most metalworking lines will have been retarded only slightly. But if the strike should last long enough for many steel mills to be affected, the slowdown will be felt for several weeks after coal once again becomes available.

The strike has assured one thing: conversion steel deals will be in effect considerably longer than they would have been otherwise. Big users are taking no chances. They are paying premium prices to be certain that they receive "on time" the requisite tonnage of steel to meet schedules.

Steel demand has perked up as a result of the coal strike. Consumers are trying to protect themselves against shortages. As an aftermath of the strike, steel operations probably will run along at a very high rate longer than if there had been no interruption to raw steel output.

Expenditures for Producers' Equipment as a Percentage of the Value of All Physical Production



As shown in the chart above, expenditures for capital goods in the postwar period rise far above the projection of the 1900-30 trend line, the greatest excess being in 1948. The chart is from a new publication, *Capital Goods Review*, to be issued quarterly by Machinery & Allied Products Institute. MAPI's analysis suggests "that the present stock of equipment in use is approaching normal, though still moderately below it." From here on out, the MAPI quarterly states, if the equipment producers are to maintain an aggregate volume comparable to that enjoyed since the war they must create a new normal by stimulating a more rapid turnover of equipment.

FASTER GRINDING — FEWER WHEEL DRESSINGS — LOWER COSTS

Economies gained by a New England plant* using TEXACO SOLUBLE OIL

In this spindle grinding operation, an emulsion of *Texaco Soluble Oil D* is far out-performing the previously used high-priced competitive coolant. This is shown by a comparative run in which the same number of pieces was ground with each lubricant in turn.

Throughout the test, the wheel protected by the *Texaco Soluble Oil* emulsion required no dressing at all. Wheel size and corners were adequately maintained. With the competitive coolant, wear and corner breakdown sufficient to require wheel dressing occurred before half the run was completed.

In addition, *Texaco Soluble Oil* kept the wheel open, assuring faster cutting and better finish, and considerably reduced the total time for the run.

Examples like this of lower cost machining are the rule when *Texaco Cutting, Grinding and Soluble Oils* are on the job. A Texaco Lubrication Engineer will gladly help you gain these same benefits in your plant—whatever your metal working operations. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Operation: Grinding spindles to remove .020" stock
Metal: 4150 steel, hardened to 40-45 Rockwell
Machine: Cincinnati Filmatic, 10" cylindrical grinder
Emulsion: Texaco Soluble Oil D at 58:1

Name of this Texaco user on request

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How To Budget For New Equipment

Why not set aside a fund to be spent in good times and bad for replacement of old equipment, a fund not affected by the ups and downs of the business cycle?

Perhaps the experience of a small Connecticut metalworking concern is the tip-off that we are not talking about the impossible. It has done a down-to-earth job of establishing what it regards as a reasonably foolproof method.

HERE IS THE STORY: a substantial part of the company's plant and machinery at the end of World War II had been amortized as provided by federal regulations covering emergency facilities. The result was an accumulation of considerable cash reserves. Prudence dictated that the cash be conserved to replace the equipment as it wore out. The company thereupon established and carried on its books a Plant Replacement Fund.

This fund was invested in government bonds with maturity dates coinciding with the anticipated remaining life of the assets. The size of the fund was determined by computing the amount of interest on bonds of varying maturity dates which would yield ultimately enough principal and income at maturity to replace the old machinery as it wore out.

Since the fund's establishment, the company has followed the practice of adding to the fund the amount of the annual depreciation charge. As new equipment is bought, that part of the equipment cost which represents items previously funded through the Plant Replacement Fund is paid for out of such funds.

THIS COMPANY'S PROGRAM is a practical solution of a vexing problem. As machinery deteriorates, depreciation charges are not allowed to accumulate in current assets where they may easily be diverted to other purposes.

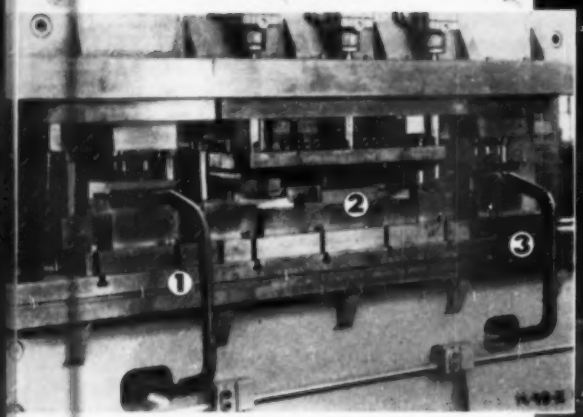
Moreover, with such a fund set aside to maintain the plant in top shape, new machinery can be purchased regardless of economic conditions. More time, thought and attention often can be given to manufacturing methods and tooling when things are slack, and often better quality and service can then be secured. And lower costs are more essential in lean times than in boom days.

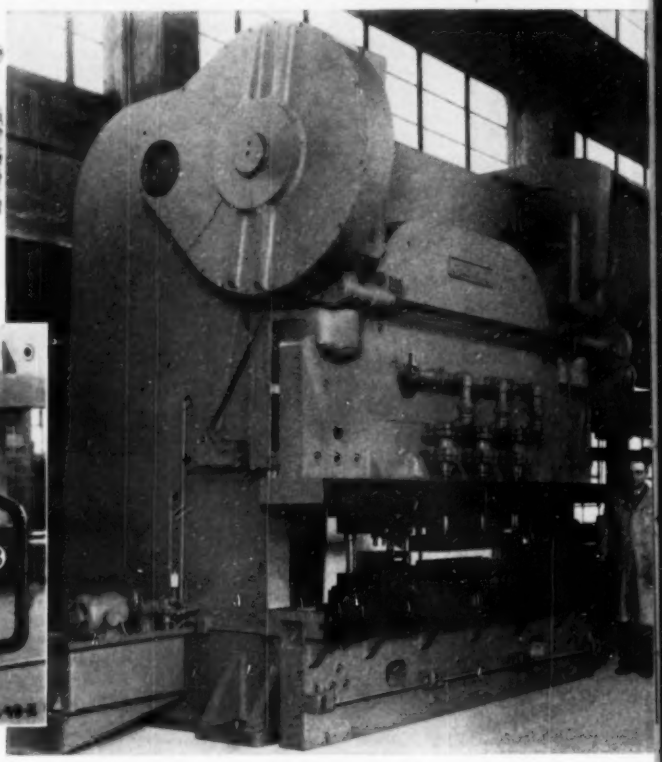
THIS NEW-EQUIPMENT buying plan eliminates the painful necessity of factory managers trying to put a new-machinery requisition across the "Old Man's" desk when business obviously is bad. The plan works automatically.

Here is a plan worth exploring. It operates in a field in which management can make a handsome return on its cash investment. We strongly urge you to consider setting up a Plant Replacement Fund in your budget.

Burnham Finney

COSTS CUT FROM $25.26 to $2.24





Photographs courtesy of International Harvester Company

Simultaneously punching **3** draw bars on self-contained interchangeable die sets.

1000-Ton Cincinnati All-Steel Press Brake punching 1045 H.R. Steel tractor draw bars.

The cost of two machining operations on draw bars for International Farmall Tractors was reduced from $25.26 per hundred to $2.24, by changing the method to punching on a Cincinnati Press Brake.

This Cincinnati 500 series All-Steel Press Brake is punching 13 holes and 2 slots in ⅜" SAE 1045 H.R. steel draw bars. Hydraulic strippers clamp draw bars flat and strip punches effectively. High visibility of work is obtained. Two types of bars are produced and interchangeable dies are engineered for easy, quick changeover.

Investigate! Your costs may be reduced by using a versatile Cincinnati All-Steel Press Brake.

Write for the comprehensive and suggestive catalog B2A on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

CINCINNATI

ARE SHOP MEN SCARED OF HIGH-SPEED MACHINING?

We are wasting much of the potential of carbide—even of high-speed steel—tools, say progressive production men, because we fear new horizons and new thinking. Here's what they're doing—and you can do—to slash costs by improving finish and tool life and cutting power and time

BY E. J. TANGERMAN, MANAGING EDITOR

WE ARE slowpokes at machining, to answer my own question of two months ago. We are not, as an industry, taking full advantage of the known machinability of ferrous materials with carbide tools, nor are we in all cases even using HSS nearly as well as it can be used. Since publication of my previous article, I have visited a number of plants and have seen a number of "impossible" things. Some are experiments only; more are accepted shop practice. All open vistas of production increases that are almost unbelievable.

Our recent increases in machining speeds have been made by the same method that kids use in testing new ice—gingerly sliding out sidewise until a real or fancied cracking sound sends us skittering for the shore and safety. The "shore" in this case is such accepted speeds as 500 fpm for turning and milling, 200 fpm for planing, 300 to 400 fpm for machining cast iron, and so on.

As Dr. M. Eugene Merchant, senior research physicist at Cincinnati Milling Machine Co. says: "Full advantage seems to have been taken of carbides in most cases, in the machining of tough alloys; **very little advantage seems to have been taken of the economical cutting speeds possible with carbides on readily machinable materials.** For example, a cast iron with good microstructure, annealed, can be milled with carbides at 1200 fpm with practically as good tool life as can be obtained at 200 to 300 fpm with cast iron of pearlitic microstructure."

This is to report that some shop men have been testing the new ice and have found it firm. Of course they had troubles; who doesn't? Sometimes it was the wrong coolant, or the wrong tool shape, sometimes a critical area or zone which I called "Valley of Death" in my previous article. But the higher machining rates, when they discovered them, justified their effort in higher efficiency and finish, longer tool life and lower required horsepower—all leading to startling reductions in costs.

How high we can go in machining feeds and speeds is one of the most challenging problems in Metalworking today. This article explores what is being done and hints at what may be done in the future. It is so searching, and the facts turned up are so important as a guide to management, that I am taking the unusual course of calling it personally to the attention of all readers of American Machinist.

Burnham Finney
EDITOR

Dr. Salomon's 1931 predictions of high cutting speeds materialized in the field of light alloys during the war years. It was found perfectly practical to mill aluminum at speeds up to 14,000 fpm, with no indication of an upper limit, in research at Cincinnati Milling Machine. But limitations of bearing maintenance and vibration held most high-speed production milling during the latter part of the war to speeds not much above 6000 fpm. Hans Ernst found that improvement in chip formation continued up to about 8000 fpm, with little improvement above that except time savings. Other wartime research reached 19,000 fpm in milling aluminum, 22,000 fpm on cast iron, and 2600 fpm in milling steel. General Motors milled SAE 4140 steel at 1285 fpm **with very high feeds—and found that neither work nor tool heated excessively.**

This last statement may be a key to the problem — at least in milling. Or so thinks William Coomey, general superintendent of the Rice Barton Corp., Worcester, Mass. He was asked recently by a well-known milling-cutter manufacturer to test a new solid face mill with inserted carbide tips. To be used in milling steel of 350 Brinell, the cutter was 2 in. wide, was to take a cut ½ in. deep with 0.020-in. chip load per tooth, utilizing climb milling. Initial tests were made at 200 fpm,

successive ones at 250, 300 and finally 375 fpm. Representatives of the cutter manufacturer were unwilling to risk tool breakage by running at higher speeds than this, but Mr. Coomey feels the cutter could have been run much faster.

Maintain Chip Load

To explore this point further, Mr. Coomey had a ¾x6-in., 8-tooth carbide-tipped solid cutter made up. Taking a ½-in. cut by climb milling, and **maintaining 0.020-in. chip load per tooth, he has reached 1435 fpm and excellent finish** with this cutter and feels he could go higher if machine capacity permitted. Speed and power of the test miller are sufficient, but the fastest feed is only 60 ipm (corresponding to 575 fpm). To get the 150 ipm necessary to maintain chip load, Mr. Coomey fed with the table rapid-traverse mechanism. This procedure is not recommended by the machine manufacturer because the traverse clutch is not designed to carry the load, but the cutter whips through SAE 1030 like a wood planer cuts through wood, and with no more difficulty. Chips are too hot to touch when they land ten feet away, but both cutter and work remain cool without any coolant.

Cutter teeth are carbide tipped and ground with 0° axial rake for ⅛ in. in center, with edges cut back to 10° axial rake. Arbor is splined, as are spacing washers

Here is the second point of importance: **Proper grind and chip load concentrate the heat in the chip.** The cutter, made by Nelco Tool Co., Manchester, Conn., is of special design. It is a side-milling type, with ½x¾-in. carbide blanks sandwich-brazed to the outside faces of the teeth rather than being inserted. In accordance with Mr. Coomey's preference, a nickel shim replaces the commoner copper one between bit and tooth. Mr. Coomey believes that copper is "rubbery" as a shim material, that nickel is better able to take the thermal shock when the carbide is brazed to the body, lessening the likelihood of surface cracks from strain, and also has a coefficient of expansion midway between that of steel and that of tungsten carbide. He has used this design in planer tools for the past two years, achieving surface speeds of 310 fpm on 40% steel castings with excellent tool life and surface finish regardless of interrupted cuts.

The cutter has a special "trihelix" grind, a flat central surface or land ¼ in. wide with 0° radial and axial rake and two side planes with 10° negative axial rake—in other words, a negative axial rake on each side of an axial land. This causes chips to "fold in," reducing edge friction and one heat source.

Initial tests with a standard keyed arbor resulted in jamming of the key, so this arbor has been replaced with a 6-spline arbor made according to the design originated by J. H. Hogan of the East Plant, G. E., at Pittsfield, Mass.

Concentrate Heat in Chip

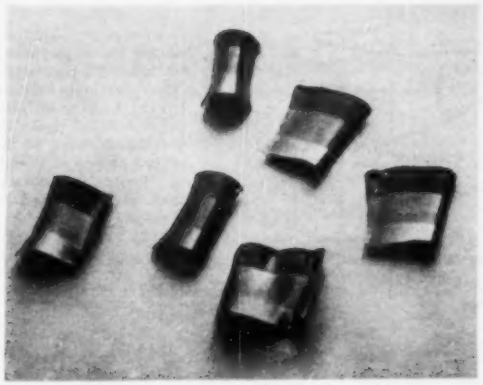
Mr. Coomey believes that **successful operation of carbides at very high speeds demands a combination of feed and speed that results in all the heat entering the chip** rather than the work or the cutter. This can be done by maintaining the chip load, providing the tool is kept sharp. "I contend," he says, "that when using carbides for turning, milling, boring or any other machining, maximum tool life and greatest efficiency can be gotten out of a piece of carbide only when it is run fast enough and the proper chip load is maintained. If this is done, heat will be dissipated into the chip rather than into the work or tool." (As Editor Fred Miller said 50 years ago that they should for optimum machining.)

"A lot of people will not agree with me on the matter of high speeds," says Mr. Coomey, "because they try to run tools at high speeds and find the heat enters work or cutter. That will happen unless proper chip load is maintained, because the high speed will put frictional heat into the work

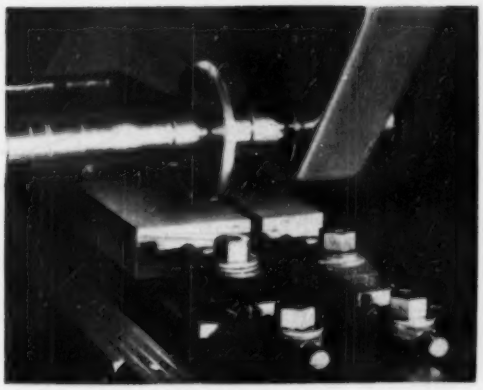
High Speeds Require Exact Cutter-Tooth Spacing

Rice Barton engineers found that when one worn tooth on a carbide-tipped cutter was replaced, that tooth was likely to break first. Checking showed the new, thicker, tooth tip was as much as 1/16 in. ahead of worn ones in tooth-to-tooth spacing. At normal milling speeds this is unimportant, but at higher speeds it sets up vibration and overloads the new tip. An accurately indexed ratchet-tooth form in the cutter grinder produced uniform tooth spacing, and cutters cut "smooth as silk" without breakage.

In some cases, new cutters placed in operation just as received created excessive vibration at high speed. They were found to be similarly off ballance, so were reground in the ratchet fixture. A great deal of stock had to be ground off some teeth to attain accurate tooth spacing, but results were "unbelievably improved."



Chips of SAE 1030 show effect of special grind as well as temper colors. Two are from a ¼-in. cut, the rest from a ½-in. cut. Chip width is ¾ in. and thickness 0.020 in.



High-speed photo shows cutter milling steel dry as if it were wood. Chips are thrown 5 to 10 ft. and there is some sparking on exit side *(Photographs by Howard Rick, Jr.)*

and cutter. For instance, if we cut with a chip load of 0.002 to 0.003 in. at 1435 fpm, the work heats—just as it does when at proper chip load when the tool begins to dull.

Keep Cutter Sharp

"When should the cutter or tool be ground? **Not until heat starts to go into the work.** That is the barometer by which we go. Frequently, the cutter does not look dull, and when it is returned to the toolroom, we are in for a battle. They won't want to grind it because it doesn't **look** dull. But whether it shows it or not, it is beginning to wear down—or the work wouldn't heat—even if the dulling can't be noticed with the naked eye. Taking 0.001 to 0.003 in. from the carbide with a diamond wheel brings it back where it belongs at minimum waste of both carbide and diamond, because longest tool life is achieved by **keeping** the tool sharp, rather than by resharpening."

Before we leave Mr. Coomey, there is another aspect of the problem that is extremely interesting—the matter of power required for milling. In the case of the test cut 2 in. wide, 39 hp were required to mill at 200 fpm, according to an attached horsepower meter. **At 250 fpm, horsepower required dropped to 38; at 300 fpm, it was 36; and at 375 fpm, horsepower dropped to 31.**

In later tests with the ¾x6-in. cutter, Mr. Coomey found that climb-milling a block of SAE 1030 at 300 fpm, with 0.020-in. chip load per tooth, required 36 hp. **When cut speed was raised to 1435 fpm, with the same chip load and depth of cut, horsepower dropped to 29.** No figures are available for intermediate speeds, because it was not possible to get a proper combination of speed and feed to achieve 0.020-in. chip load; there were no suitable feeds.

How to Save Money

Considering these interesting data, let's work out a couple of K factors. Taking cut width at ¾ in., depth as ½ in. and chip load 0.020 in. in each case, spindle speed was 193 rpm and feed 30 ipm at 300 fpm, while at 1435 fpm speed was 914 rpm and feed 150 ipm. Thus at the low speed 11¼ cu in. per min of metal are removed at a cost of 36 hp, while at the high speed 56¼ cu in. per min of metal are removed at a cost of 29 hp. At 300 fpm, therefore, the K factor is 3.2 hp per cu in., while at 1435 fpm it is 0.515 hp per cu in.—giving **roughly five times the stock removal at six times the efficiency.**

Similar analysis of Mr. Coomey's earlier planing studies gives similar results. He takes a ⅜-in. deep cut with 1/16-in. feed on four heads, on 40% semisteel castings. At 180 fpm, 92 hp were required to remove 204 cu in. per min of chips; at 310 fpm, 55 hp were required to remove 351 cu in. per min. Thus the K factor at 180 fpm is 0.45 hp per cu in., while at 310 it is 0.156 hp per cu in.—**roughly half again as much stock removal at three times the efficiency.** (These chip-removal computations are based on instantaneous values because actual volume of chips in a 1-min. period is approximately half the instantaneous value, because the tool is cutting only half the time.)

Mr. Coomey's mania for speed—if mania it is—is catching. Recently, the Worcester Engineering Society turned out a record attendance to hear Mr. Coomey and three other men from other large Worcester plants explain why they've shifted to carbides, how they handle the resulting problems and what they've achieved. Take Joseph Jacobs of Morgan Construction Company for example. His company builds special wire and rod mill machinery with heavy cast-steel frames and other large parts like drums and big gears. Everybody knows the headaches of cast steel; sudden hard spots and abrasive inclusions that knock tools for a loop. **With carbides, Mr. Jacobs gets much higher speeds—and at the same time the interest and cooperation of shop men, because headaches due to abrasive inclusions are things of the past, the job goes faster and there's less trouble in tool grinding and setting.** Mr. Jacobs put in chip conveyors

on lathes, boring mills, etc., equipped with carbides. Men don't like to rake chips; it costs maybe an hour per day of machine downtime. Chip conveyors pay for themselves in a year. With such aids, the operators enjoy seeing chips fly.

A roll housing is machined at Morgan on a new 84x72-in. Ingersoll planer-miller with 80-hp. motor. Operations formerly took three machines and numerous set-

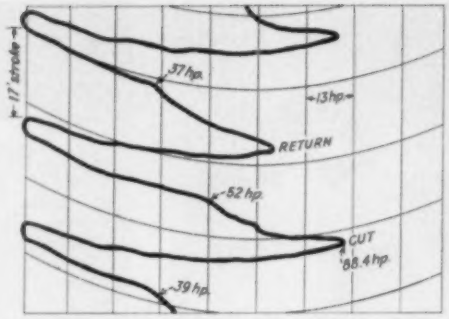


Chart record of 310-fpm planing shows power input to ac driving motor (50-100 variable-voltage drive). Cutting-stroke power demand peaks at 88.4 hp, declines to 52 hp before power is cut off. On return stroke, peak power demand is about 69 hp, dropping rapidly to 37 hp before cutoff. Thus only 15 to 20 hp are required for actual cutting

HSS Cutter Acts Like Carbide

Engineers at Jones & Lamson took a 3½-in. dia x ¼-in. width, 12-tooth HSS milling cutter of the standard stagger-tooth type and ground out two of every three teeth. The remaining four teeth were ground with 34° positive radial rake and 14° helix. With a chip load at corners of 0.0114 in. (middle 0.0057 in.), obtained by table feed of 26 ipm, they climb-milled SAE 1020 at 560 fpm—equal to normal carbide performance . . . Having reached 1500 fpm in turning steel, they expect soon to try 2000 or 2500 fpm.

tings, because there are 54 different points to be milled. To save time and avoid special tools among the 22 cutters required, **Mr. Jacobs equipped the machine with quick-change holders** to fit drills, end mills, shell end mills, etc. Instead of milling a slot with a stub arbor (introducing overhang) Mr. Jacobs developed a 3-flute end mill for blind milling the slot and sinks it to depth at a rate of 2 in. per min.

Morgan uses feeds up to 20 ipm on deep cuts, **maintaining a chip load of about 0.017 in. per tooth at 300 sfpm because it appears to give best cutter life.** (Material power factor is 0.9). T-slotting is being done at 23 ipm feed with 0.015-in. chip load per tooth, using a staggered-tooth carbide cutter with positive rake. Cutter cost on 24 housings which take 2½ months to machine was only $100, while time savings were about 50% on the job. On threading and grooving, operators also prefer carbide because jobs are less tedious and messy whileleading is not necessary—while the job goes six times as fast. **Have other companies been missing a bet by not "selling" carbides to their men as a device for taking the humdrum ordinariness out of disagreeable jobs?**

Cast steels up to 550 Brinell are regularly machined by Morgan. Excellent surface finish is secured with carbides, avoiding need to grind in some instances. One material, 650 Brinell, was machined at 13 sfpm with carbide and finished quicker than by grinding.

One more point before we leave high-speed milling: Hans Ernst, research director of Cincinnati Milling Machine Company, says: "As far as I know, nowhere has it been found that extremely high speeds (over about 1500 fpm) can be used **economically** when milling ferrous material. In our research we have milled cast iron at speeds up to about 15,000 fpm, but found no indication of increasing tool life due to lowering temperature at these high speeds. In fact, in every case we found that tool life continued to decrease in this range as the speed was increased. This is, of course, by no means a closed subject; tomorrow's findings may entirely change the picture."

Mr. Ernst's statement has been borne out in a number of recent cases, at least as far as cast iron is concerned. Whether the failure of this material to form a conventional chip or its different structure may be the cause, nobody knows, but the fact remains that most companies have not been able to reach even 1500 fpm economically on CI. Somewhere in the range of 300 to 400 fpm seems to be best. **But Mr. Coomey has just tried face milling at 500 to 700 fpm—maintaining the 0.015- to 0.020 in. chip load—and has gotten better tool life than at 300 fpm, his previous top.**

There is broad agreement that, at higher speeds, some change occurs in chip formation or cutting-edge conditions—**but only if a chip is formed.** But actually in most plants, speeds are nowhere near the optimums even for cast iron.

Basic Plant Layout May Be Obsolete

One old plant found new machine tools upset production schedules. Basic study of the problems resulted in a shift from departmental to straight-line production, with some old machine tools rebuilt or repowered and others replaced. In three years, materials-handling equipment has been increased 1000%, machine tools have decreased 40% in number and number of workers 25%—with no reduction in output. Labor has been broadminded about the shift—perhaps because the plant faced failure from high production costs.

Another plant made the same rearrangement while rebuilding its polyglot century-old plant into a modern one on the same site. Progressive rebuilding has taken three years, but resulting production improvements will pay off costs in three to four years through 10% cut in production costs and 25% cut in overhead. Here again, high-speed modern machine tools have played their part.

SUMMING UP HIGH-SPEED MACHINING ...

- **High speeds save time, improve finish (thus avoiding, or reducing, secondary operations), cut power costs.**
- **Speed increases frequently require new equipment, streamlining of production, more efficient handling.**
- **High-speed machining should be adopted as a group project, not as a single-machine one, to keep planning and production straight.**
- **Labor must be shown the advantages to win its cooperation.**
- **Many older machine tools do not have necessary power or spindle speeds, many new ones do not have a high enough feed range.**
- **Chip load can and should be maintained when speed is increased.**

There are many cases of individual shifts in machining methods or lines which permit full utilization of modern tooling and speeds. One plant has put in three Fay automatics, handled by one operator, to turn, bore, chamfer, face and form a CI bevel gear. They replace 14 single-operation machines that were 35 to 40 years old. The gear is first gripped on the cast and bench-burred bevel teeth to true the casting, then reversed for succeeding operations. Total time is under 2 min per piece, at 322 fpm.

On a bar-steel job in another plant, two modern setups are being used. One is a 16-in. American hydraulic shaft-duplicating lathe which turns, faces and forms 2-in., C-1117 steel (0.23 C) at 1700 rpm and 0.008-in. feed, giving a surface speed just under 900 fpm. It replaces seven obsolete machine tools. In tests at speeds from 1050 to 2000 rpm (550 to 1050 fpm) the range between 550 and 700 fpm proved entirely impractical; there tools break down and finish falls off. Here again is a narrow valley of death—at least at the feed-and-speed combinations which have been tried.

The other setup on the same job is a group of three Sundstrand Stub lathes handled by a single operator which attains a 3.9-min floor-to-floor time and replace 14 ancient machine tools. **Tool engineers estimate that six Stubs, two Pacemakers and five Monarch lathes—total of 13 new machines—will replace a department of 30 obsolete machines.**

In another plant, two new Sundstrand lathes, facing both ends of a shaft to length and centering both ends, have replaced nine old machines. A new Kingsbury 6-station machine with drum feed drills, reams and countersinks both ends of a small roller, has cut time to only 0.18 min per piece. Even though there is only enough work to operate it about a week a month, it has already paid out in labor and scrap savings. **Such changes have made it possible to reduce 90 machine tools to 18 because of the higher speeds of the latest type machines.**

Still another plant has cut the area of its gear department in half, reducing the number of machine tools from 250 to 97 for the same production, by utilizing better feeds and speeds on existing machines and replacing where real savings could be shown. Cutter speeds for hobbing cast iron gears there are now 100 to 125 fpm, with 0.040-in. feed in some cases, about double the old optimums. Gear shapers operate at 107 fpm, with 2½-in. stroke and 0.0027-in. feed, cutting two gears at once at 325 strokes per min. On steel, shaper feed is reduced to 0.0022 in. per stroke. Gear blanks are roughed at 250 to 300 fpm, with ⅛-in chip, finished at 500 to 600 fpm with 1/32-in. chip, while cast iron is roughed at 250 fpm and finished at 400 fpm, with 0.020-in. feed in each case. Carbide tools are used for all jobs except shaping.

Other Factors Count Too

A cooperative program, described by Ben Brosheer in a later article in this issue, describes development of tools and techniques which permit climb-hobbing of cast iron gears at 450 rpm with 0.060-in. feed, SAE 4135 gears at speeds up to 702 rpm with 0.100-in. feed in each case using carbide hobs 4 in. in diameter. These speeds approximate 460 and 725 fpm.

Speed increases and tooling techniques may not always be the answer; sometimes it is a complete change of process. At Saco-Lowell Shops, for example, Reed thread rollers produce a 21/32-in., Class 3 thread in 0.40 min cycle time, compared with 1.41 min for turning, and give better finish. Another Reed machine does precision knurling, putting six 2-in. knurled sections on a 1 1/16-in. bar in 0.68 min and replacing six lathes formerly required for step turning. Bars are centerless ground before knurling, and a total tolerance of 0.003 in. is maintained even though knurling increases bar diameter 0.020 in.

Preceding examples might be multiplied endlessly — including many automotive cases not mentioned here—but they all point to the same basic principle, that the way onward is to still higher speeds and feeds in order to utilize efficiently the tooling and techniques which we now have available.

Tips FOR TOP SHOP MEN

323 Don't put a worried man on a critical job. If safety is a function of flawless timing, the man with something else on his mind is accident prone. Give him a safe job for a while, until his sorrow, illness, financial ailments, or mental scramble can straighten itself out.

324 If you resent interruptions when you're busy, set the example by not interrupting others when they're busy. If you are careless with your men's privacy, you can expect them to be careless of yours.

325 Are you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

- **IF** *a man makes a mistake*
- **IF** *his attitude is bad*
- **IF** *his actions are upsetting other people*
- **HOW** *can you straighten him out so he will do as you ask and do it willingly?*
- **HERE,** *in a case history that develops five steps*

for curing the "sore spots" in your organization, is . . .

HOW TO CORRECT A WORKER AND

BY EDMUND MOTTERSHEAD

MOST supervisors today are fully aware that the old method of bawling out a man for doing something wrong doesn't get the desired results. In fact, such crude methods frequently are limited by union contracts and basic labor-relations policies. However, the problem still exists: How do you correct a worker, get his cooperation, and make him like it?

Take the Case of Tom Sanderson:

Tom was a young man, single, about 25 years old, a veteran of 3½ years of service in the Pacific. He had had two years of college, played on the college football team, and after his release from the Service had decided to work full time and attend school at night, working for an engineering degree.

At the time our story opens, Tom had been employed by the Acme Specialty Manufacturing Company as a trainee, working at a number of miscellaneous jobs. He soon demonstrated that he had a far better than average mentality and was developing into a good and highly productive worker. Having been with the company about eight months, he had received one pay raise in accordance with normal procedure. The personnel department had him under consideration to move into quality control and eventually into the engineering department.

Tom Had a Hot Temper

However, it was soon discovered by his associates and bosses that Tom had a very hot temper. When his supervisor asked him to do something that perhaps was not directly connected with his work as a trainee, Tom usually showed very little enthusiasm. Several times he had been unpleasant to other workers, surly with his supervisor, and in other ways had indicated his unwillingness to do anything but the work immediately assigned to him.

On this particular occasion, Tom's department was moving a section of parts bins, and his supervisor asked him to help the head storekeeper, Sam Smith, with the work. The supervisor said that Sam would show Tom what to do and that the job probably would take most of the afternoon. He also told Tom to finish a drawing he was doing, then help Sam.

A couple of hours later, the supervisor, at Sam's request, told Tom to go to work immediately moving the bins. Tom said he wasn't finished yet but the supervisor told him to let the drawing go for the time being anyway and to get going on the bins.

Menial Jobs Irked Him

Tom went to work with the others, helping to move the bins. In his haste to get back to what he considered more important work and in his annoyance at having to do menial work of this sort, Tom managed to get some boxes in the wrong bins and otherwise mix things up. Sam told Tom how to straighten them out, and Tom snapped back at him with something about having had enough bossing in the Navy, and that Sam wasn't his boss anyway, and if Sam wanted the bins a certain way he could do it himself, and so on. The upshot was a row in which Sam became very angry and went to the supervisor with the story. At this point the supervisor himself got mad and went to talk to Tom.

The Boss Gave Tom a Blast

Of course, the supervisor shouldn't have lost his temper, but he was human, too. What he really wanted was to keep a good worker on the job, get him to be more friendly, to cooperate with the other people around him, to do as he was told willingly and pleasantly, and to start on this road by making peace with Sam. Instead—

Tom was still moving the bins with the others when the supervisor got there. The supervisor called to him: "Tom, what's this trouble you and Sam have been having? I told you to help him, and he comes yelling at me that you've been unpleasant, insulted him, refused to do what you're told. Do you think you're too good to help out on this job the way the others are doing, or what?"

"Well, no uh, I just. . . . . "

"Look here, you've displayed your bad temper around here more than once. We can't have this

MAKE HIM LIKE IT

sort of thing. And I want to warn you that one more row like this, and we'll have to get someone else to handle your job. Now get back to work and go along with the rest of us. Sam will show you where to put that stuff, and you do what he tells you!"

Why Was the Boss Wrong?

Although there were several things wrong with Tom's conduct and he had tried everyone's patience sorely, the action taken by the supervisor had several bad spots:

1. He jumped on Tom publicly, bawling him out before others, and gave him no chance to say anything or to defend himself. Tom was ill at ease anyway, and this method simply made him feel more insecure and dissatisfied.
2. The supervisor gave no evidence of interest in Tom's problem, or in the reason Tom had acted as he did.
3. The supervisor jumped to conclusions and acted arbitrarily in a way that relieved his personal feelings, but failed to show Tom how compliance with the supervisor's request would do Tom any good.
4. The situation revealed that the supervisor's previous relations with Tom had never reached the point of understanding or friendship, which might have made the present difficulty unnecessary.

It so happened that there were a few things the supervisor didn't know. Tom had had a bad time in the Service. He had started to college planning to be an architect, like his father. His father died while Tom was in the Navy and when he was discharged, he had to go to work to support his mother. Tom was carrying a full engineering course at night school, working hard during the day and studying far into the night. He felt better educated, thought that he was carrying a bigger load and was more "worthy" than the others, and resented doing the menial tasks that they might just as well do and leave him to do more "important" things. Actually, Tom was a sincere, hard-working, overtired young man trying to do too much in too short a time, with his sense of values a bit off center.

Had his supervisor been in possession of this information, known something of Tom's home problems and personal ambitions, he might have handled the situation much differently. Even without this knowledge, the supervisor could have realized his objectives of keeping a good man on the job and getting cooperation by using this technique:

Step 1—Put Tom at ease, talk to him privately.—Call him away from the others and simply tell him to go ahead and do his work at the moment, and then come have a visit in the supervisor's office later in the day. In that visit, start by being calm, reasonable, demonstrating a helpful attitude and a friendly interest in *Tom* and *Tom's problems*. Get Tom to talk.

Step 2—Define Tom's real problem in your own mind.—Talk to Tom about his basic problem of getting along; avoid the immediate sore spot at first. Make it clear that you are primarily interested in helping Tom solve his major problems. Find out what they are (supporting his mother, education). Show him that you have as great a selfish interest as he has in solving those problems, and that if Tom doesn't solve them while working here, he will have to solve them eventually somewhere. Be sure you have all the facts and can define his real problems.

Step 3—Demonstrate that what you want Tom to do will help him with his problems.—Describe what you want him to do—specifically. Show him definitely what type of conduct is needed, when and where to control his temper. Show him how getting along well with others is a necessary stepping-stone for a man of Tom's ambitions.

Step 4—Close your "deal."—Briefly summarize your analysis of his problems and desires, and get him to acknowledge that you understand what he wants. Summarize just how his cooperation in the specific terms you mentioned will help him satisfy those wants. Get Tom to commit himself to some definite course of action. If necessary put words in his mouth so he can make his peace with Sam and begin establishing friendly relations with others. Tell him you know an about-face in attitude will be difficult, but that it will be worth while.

Step 5—Follow up.—Check back with Tom in a couple of days to see how he is doing. Talk to him privately and offer any help he might need in adjusting himself. Observe his relationships with others, but avoid talking to anyone except Tom about his problem. Give him encouragement from time to time.

Remember This Point

When faced with the necessity for correcting someone, keep in mind that it is not the *person* you are annoyed with, but his or her actions or failure to act properly. This separation of acts and behavior from personalities in your own mind is essential.

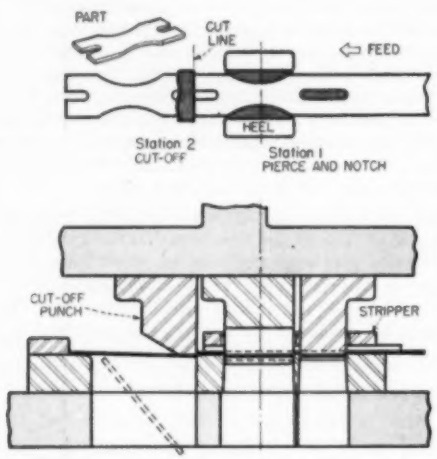
The worker who makes a mistake usually didn't do it on purpose. It is the mistake you are trying to correct. You are not trying to relieve your feelings of annoyance about the mistake; you are trying to show the worker how to avoid repeating it.

HOW TO DESIGN

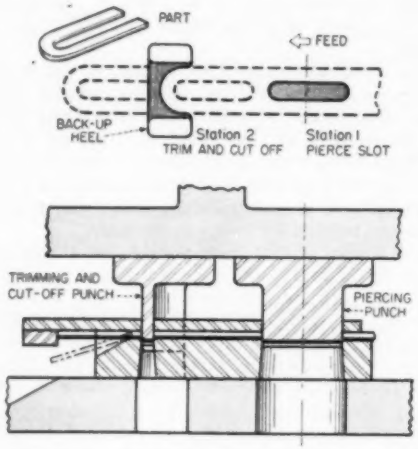
TWO-STATION PROGRESSIVE DIES

BY J. R. PAQUIN, Tool Engineer, UNDERWOOD CORPORATION

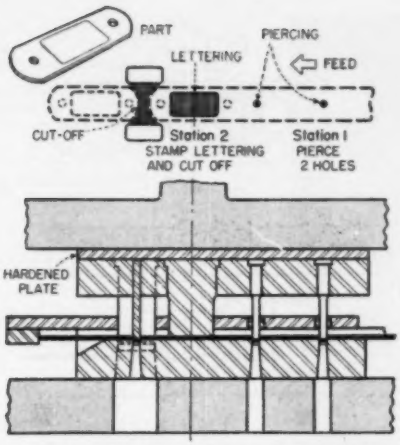
Tandem dies cost little more than single-operation tools, run faster than compound dies. Here are basic principles for applying two stations to cutoff, blanking, shaving, forming and drawing dies. But you should study carefully the contour and accuracy requirements of the job before commencing tool design



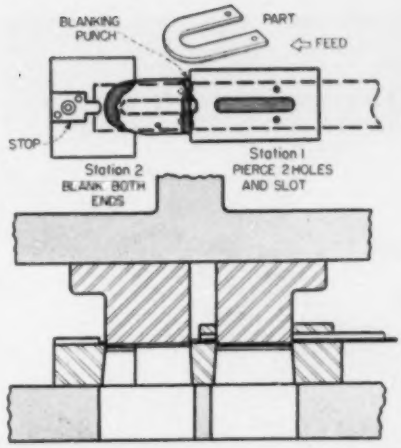
Pierce, Notch and Cutoff Die—Deflection of the notching punches is prevented by backup heels. Strip, when advanced to station 2, is severed by the cutoff punch, and the piece falls through a hole in the dieset to a tote box below. Solid stripper removes stock from the piercing and notching punches. Tool is capable of high-speed operation, and design is easily adapted to many small parts



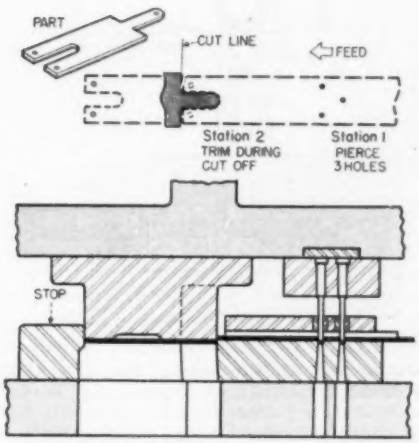
Pierce, Trim and Cutoff Die—To produce a U-shaped piece, the stock is fed to an overhanging stop. At the first station a slot is pierced; at the second station the part is trimmed while being cut off. Finished part slides down incline machined in the dieblock and dieset. Offal from piercing and trimming goes through openings in the die base to scrap boxes below



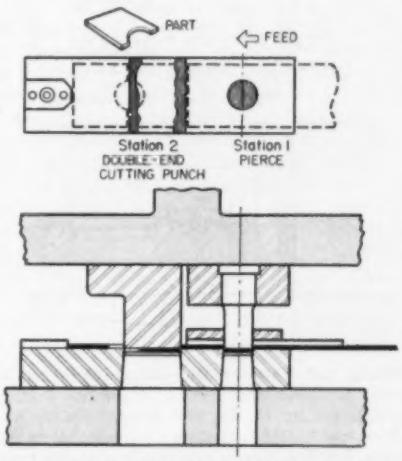
Piercing, Lettering and Cutoff Die—Metal labels for machines are produced in a two-station die having all punches backed up by a hardened plate. Piercing punches at first station are bushed in stripper plate. An overhanging type of stop is also used in this tool



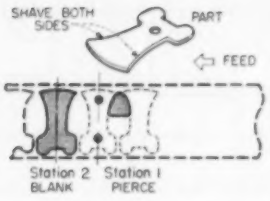
Piercing and Blanking Die—When over-all length of a part must be held to close tolerances, it is unwise to depend upon the operator for holding the strip against a stop during ram descent. For the part illustrated, good practice involves piercing two holes and a central slot at the first station. At the second station the punch blanks both ends of the piece, insuring that the correct length is maintained. As this is a push-through die the part falls through a hole in the dieset and into a box below the press



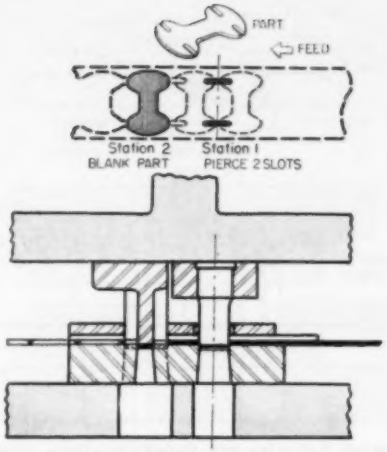
"No-Scrap" Piercing and Trimming Die—Great savings in material are effected by cutting parts from strip without leaving scrap slugs. To make the part shown, three holes are pierced at the first station. Then the strip is advanced to the combination stop and backup for the cutoff punch. The slender piercing punches are guided by hardened bushings in the stripper and are backed up by the hardened plate recessed into the punch holder



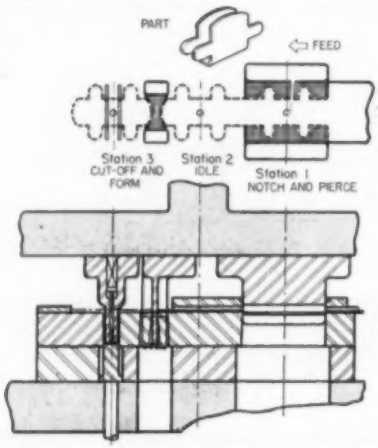
Piercing and Double-End Cutoff Die—Production of many parts can be doubled by arranging the die to produce two parts per press stroke. After the hole is pierced at the first station, the strip is advanced a distance equal to the length of two parts. In descent the cutoff punch at station 2 cuts off the two parts simultaneously, pushing one through the die, while the other remains on the dieblock and is blown off by air



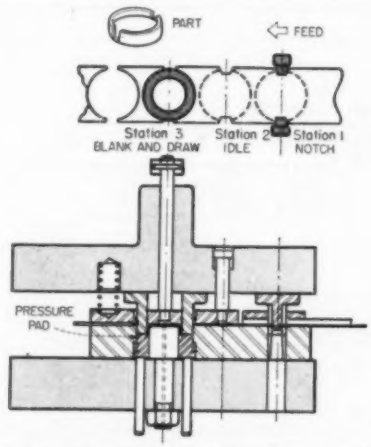
Partial Shave and Blanking Die—Shaving of a portion of a blank outline can be combined with blanking in a two-station die. At the first station, two pilot holes and an irregular hole are pierced. The punch for the latter operation is made small by the amount of shaving allowance. At the second station the strip is piloted, and the blanking punch takes only a shaving chip at the blank outlines previously pierced



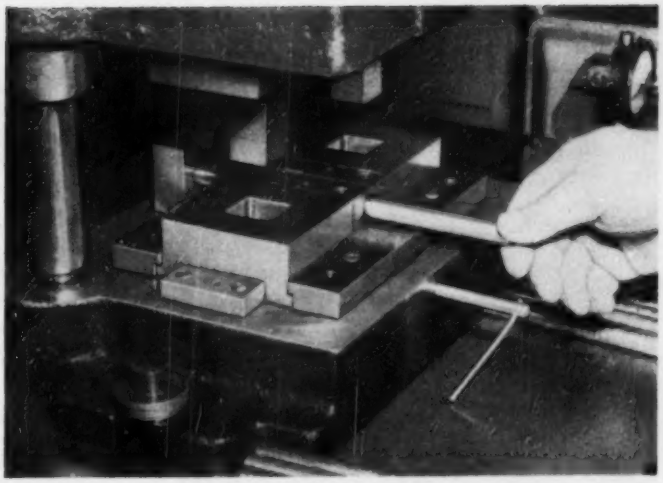
Piercing and Blanking Die—Frail inserts, as might be required in a single-station die, can be avoided by two-station construction. Example: four easily broken sections would be required in a single-station die to cut the four slots in the part shown. But by piercing two elongated slots at the first station and blanking at the second station, a successful tool results. Husky, well-supported punches are used for both stations



Notching and Forming Die—Many parts can be successfully bent or formed in two-station dies. At the first station of the tool shown, the strip is pierced and notched. It then progresses to an idle station, and finally to a combined cutoff and forming station. The cutoff punch is made longer than the forming punch. And when the blank has been severed from the strip, a pressure pin contained within the forming punch holds the part until the punch strikes it. The formed part is pushed out of the die by a knockout actuated by the pressure attachment of the press

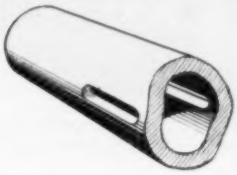


Notching and Shallow-Drawing Die—A notched mechanism cover that does not require extreme accuracy is easily produced in a two-station die. The first station embodies notching punches, the second station is idle to allow room for the drawing-station members. At the third station (actually the second working station) the part is blanked and drawn over a plug. When the ram ascends, the pressure pad strips the shell so that it can blown by air to the press rear. Should the part adhere to the punch, it is removed by a knockout. A solid stripper removes the strip from the notching punches; a spring stripper surrounds blanking punch



Hollow pinion shafts for Laundromat transmissions are punched in a 50-ton press where the operator locates the shaft, trips the press, then revolves the shaft so a slot can be punched through the opposite wall

Slots are 19/32 long by 0.137 to 0.143 in. wide, and 1 1/32 in. from end of shaft. Alignment of the slots opposite each other must be within 0.005 in., and is assured by locator pin under die which is retracted by key (under operator's hand in photo)



Hollow-Ground Punch Slots Die-Supported Tubing

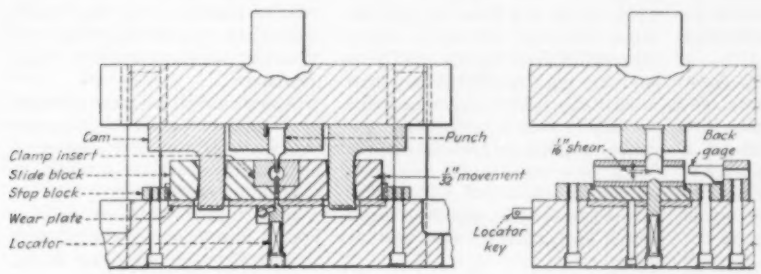
BY R. C. JOHNSON, Tool Engineer
and WARD INGRAHAM,
Mgr., Tool Engineering Dep't,
Mansfield Works,
WESTINGHOUSE ELECTRIC CORP.

THE OLD METHOD of producing slots through a hollow shaft was to drill a number of holes in line, then profile the rough edges to final shape and size. The modern shearing punch and support dies that replace the old system do the job in two strokes, and also hold the shaft so it cannot collapse.

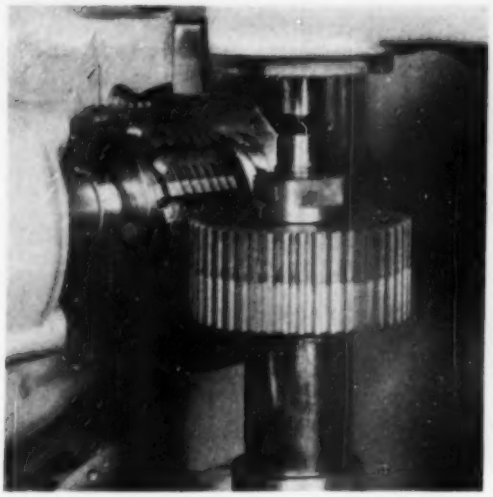
Positive-return cams are fitted to the press ram. These contact two slotted slide blocks, which close up 1/32 in. to tighten two formed clamp inserts on the shaft. As the ram drops, the dies close and the punch breaks through the top of the tube, shearing clean edges in the SAE 1137 steel because of the hollow-ground cutting face.

A locator pin fits in the first slot after the operator revolves the tube, which aligns the tube for the second stroke. After the second slot is made, the operator turns the locator key, which pushes the locator down against spring pressure, and releases the work.

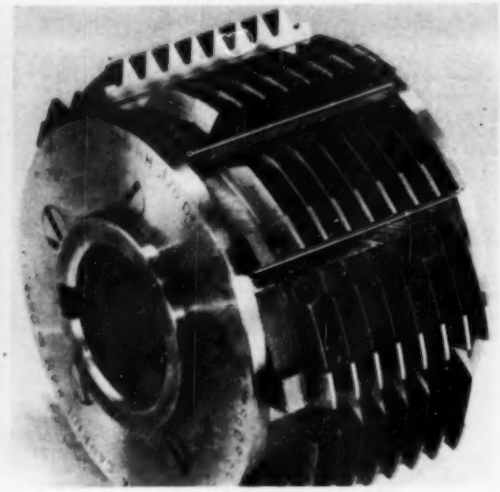
Slide blocks are made of tool steel, hardened to 58 R_c and ground; move on a hardened wear plate. The cams are made of chrome steel, hardened to 60 R_c. Clamp inserts, which are actually gripping jaws, can be reground and shimmed out to maintain contact after wear.



Shearing punch cuts slot after cams squeeze blocks which close die halves around shaft. Cams are positive-return type. Shaft can be removed only if key is turned, which depresses locator pin



Hob spindle on Model 8-B runs up to 1800 rpm in tapered roller bearings. The machine is also equipped with a completely new lubrication system



Carbide-hob insert strips are clamped between two screwed-on end plates directly in front of supporting steel extensions on the body

THREE-COMPANY STUDY DEVELOPS NEW

Carbide producer, hob maker, and machine-tool builder have evolved an advanced method of hobbing cast-iron and steel gears

BY BEN C. BROSHEER, ASSOCIATE EDITOR

HOBS with brazed carbide bits have proved successful for cutting gears of laminated phenolic plastics, non-ferrous metals, and some cast irons, but they have not, up to now, been suitable for steel. As a result of a cooperative program by Kennametal, Inc., The Lees-Bradner Company, and National Tool Company, hobs with solid carbide blades clamped in steel cutter bodies now seem to offer possibilities when operated at high speeds.

Early in World War II, Navy tests of carbide hobbing were carried on at the Joshua Hendy Iron Works, in California, and at a General Electric plant in Massachusetts. Athough pinions for destroyer drives were being hobbed with carbides by the end of the war at the Hendy plant, Kennametal engineers felt that the design—with small carbide inserts brazed to steel strips that were locked in the hub body—was not correct.

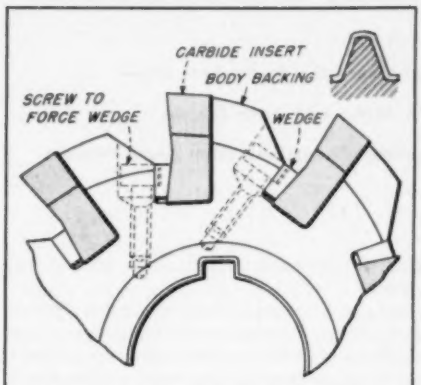
Collaboration between Kennametal and National Tool in the development of special cutters with solid-carbide clamped blades led engineers to the opinion that mechanically held carbide strips would have a number of advantages over the brazed-tip type. Meanwhile, Lees-Bradner had been studying high-speed hobbing, and in September, 1947, had announced the Model 8-B gear-hobbing machine designed for high speeds and feeds. As a consequence, the three companies undertook cooperative investigation of all phases of high-speed gear cutting with carbide hobs.

The hob they developed consists of a tool-steel body with ground slots into which formed carbide strips are clamped. Extreme precision is a first requirement; minimum bearing area of 95% between slot and carbide strip is considered essential. Strips are held in place by wedges, which in turn are locked tight by screws. Angles on strips and wedges make the construction self-locking. End plates and hold-down screws serve as added protection against any movement of the strips.

Hob design permits the use of 0.3125-in. carbide inserts in a 4-in. hob with ten gashes, much thicker than is possible with the brazed type. There is much less likelihood of strips cracking, and hob life is increased.

Carbide strips are rough-formed by Kennametal before final sintering, with the required number of teeth in each strip, so a minimum of grinding stock is left.

Teeth in a conventional solid or brazed-insert hob are ground with a relatively small-diameter wheel.



End view of hob shows wedging action of screws. K6 Kennametal is recommended for cutting cast iron; Grade K4H for steel. Climb milling gives best results

Test Results When Carbide-Hobbing Forged-Steel Gears

TEST NO. 1—CLIMB CUTTING

Hob Setting Number	1	2	3	4	5
Shift after previous cut, in.	—	0.100	0.200	0.100	(A)
Hob Speed, rpm	450	450	702	702	702
Feed per Revolution, in.	0.070	0.100	0.100	0.100	0.100
Cutting Time, sec	132	95	55	55	55
Number of Gears Cut	14	16	10	10	20
Wear on Teeth, Max, in.	0.003	0.010	0.050	0.060	0.070

Note: (A) Cut No. 5 made at same hob position as for cut No. 1. At setting No. 2, two teeth were chipped 0.020 in.

TEST NO. 2—CLIMB CUTTING

Hob Setting No.	1	2	3	4	5	6	7
Shift, in.	—	0.050	0.050	0.050	0.050	0.100	0.200
Hob Speed, rpm	702	702	702	702	702	702	702
Feed per Rev, in.	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Cutting Time, sec	55	55	55	55	55	55	55
No. of Gears Cut	12	8	10	10	10	10	2
Wear on Teeth, Max.	0.003	0.003	0.005	0.015	0.020	0.040	0.050

Gears were cut two at a time, mounted back-to-back on arbor. Gears made from SAE 4135 steel forgings, 170-196 Brinell hardness. They have 29 teeth, 39° helix angle, left-hand, 3.625-in. pitch dia, ¾-in. face, 0.228-in. whole depth.

Hob was 9.2376 NDP, 17½° NPA, single-thread, left-hand, 1° 41′ helix angle, preshaving, 5° negative rake, 4-in. OD with ten Grade K2S Kennametal carbide inserts having five teeth each.

For second test, hob was reground on cam relief, clearance and rake angles to improve cutting characteristics.

HOBBING TECHNIQUE

To minimize the cost of grinding teeth (in the strips) for the new hob, National Tool engineers have developed a novel method.

Strips, previously finish-ground on sides and ends, are mounted in a slotted fixture slightly smaller in diameter than the body of the hob. Clamps and end plates are used as in the finished hob. Slots in the fixture are milled and ground radially, and are centered with the axis of the jig. This permits teeth to be ground in the same manner as threads are ground in a worm. Relatively large-diameter formed diamond wheels are used, and stock is removed rapidly. Then when the strips are clamped in the offset slots in the hob body, the teeth have the necessary side and radial clearance.

After grinding, carbide strips are assembled in the body and it is ready for immediate use. When the strips must be replaced, it is necessary only to make new strips, which can be finished before mounting in the same hob.

Blade strips are not removed for resharpening. The hob is sharpened in the conventional manner with a diamond dished wheel. Rate of stock removal is about the same as when high-speed-steel hobs are sharpened with conventional wheels.

Early tests on laminated-plastic and aluminum camshaft-timing gears soon made it apparent that hob speeds much higher than were available on commercial hobbing machines were going to be quite practicable.

Lees-Bradner engineers undertook to solve these problems. Their studies resulted in a hob drive spindle which has been used satisfactorily with speeds up to 1800 rpm, as a result of a shift to precision tapered roller bearings and improved lubrication.

Today precision fine-grain cast-iron change gears are being climb-hobbed with a hob spindle speed of 450 rpm, using a 4-in., 10-gash carbide hob 2 in. long. Feed is 0.060 in. per rev. The 12-DP, ⅞-in. face gears are hobbed to full depth in one pass without coolant. A recent run of 2300 gears, cut two at a time, was completed with one hob. Only 0.010 in. was ground from the carbide cutting faces to resharpen the hob afterward. Gears cut ranged from 32 to 83 teeth. Tooth-spacing error was held to less than 0.0004 in. from tooth to tooth, and from high to low.

Development work thus far has convinced each of the three companies that there is no more maintenance, skill, or "art" involved while operating the hobbing machine at high speed than at more conventional lower speeds.

The cooperative program has been broadened to include carbide hobbing of mild-steel and alloy-steel gears. While no conclusive results of these studies can be reported now, the work already done indicates that high-speed carbide hobbing of steel gears is not to be considered impossible.

In a recent test run with a 4-in. hob with ten Grade K2S Kennametal carbide inserts having five teeth each—forged SAE 4135 gears were climb-hobbed two at a time with hob speeds ranging from 450 to 702 rpm. When the same gears were hobbed with conventional cut at 702 rpm, 0.100 in. feed per rev, only 14 gears were cut before excessive chipping started.

More and More About

"Old-timers" rise in holy wrath to point out just where the toolmakers are—some on chicken farms and some fishing. Why? These further discussions offer sound reasons

SIX-WEEK "TOOLMAKERS" UNDER UNION AUSPICES

BY LUCIEN I. YEOMANS
LUCIEN I. YEOMANS, INC.

Your article (*AM*—Nov. 17, 1949, p100) suited me pretty well, and I am amused at its aftermath—"Here Are the Toolmakers" (*AM*—Jan. 9, 1950, p90). Of the "defenders" of the current situation, Henry George seems closest to a true appraisal of the situation.

I have before me a letter of Jan. 14, 1942, from Mrs. Eleanor Roosevelt, inclosing a letter from Sidney Hillman. From that I quote a few sentences which will show you that the great ladies' garment maker was far ahead of us and knew where the toolmakers are—or at least how to produce them. I quote:

"At about that time, however (Apr. 11, 1934), the Federal Committee on Apprenticeship was appointed, and today apprenticeship in a large number of plants has regained its former status under very definite standards promulgated by the Federal Committee on Apprenticeship. These standards provide for scheduled work experience, scheduled related technical instruction, a formal agreement, joint sponsorship of management and labor, and age limits directing apprenticeship toward youth.

"The vocational schools throughout the country by and large are now supplying the supplementary preparatory training which rounds out apprenticeship experience.

"Most apprentices are young enough to live with their own families, and plants are so numerous that there hardly seems to be an occasion for young men to go very far from home to obtain this training.

"While the older skilled mechanic must be relied on for instructing the young apprentices in skilled workmanship, nevertheless not every good mechanic is a good teacher, and since speed is of the essence, it is important to carefully select mechanics who are to do the instructing and then to give them brief intensive instruction in the art of teaching. Modern apprenticeship, which is growing rapdly, has become a definte program of teaching young men and not merely an exposure to an opportunity to learn."

This is all that Sidney *SIGNED*, but at that time he gave interviews saying they were turning out toolmakers by intensive training in the trade schools *in six weeks.*

So, you and I are just old fogies, and toolmakers are everywhere. I know one of the sort the great Ladies' Garment Worker turned out who has bluffed his way along until he is shop superintendent now.

THE OLD "TOOLMAKER" IS THREE SPECIALISTS NOW

BY CHARLES KALDER
CONSULTING ENGINEER

I WANT to take issue with John R. Godfrey and also with his critics. During the late war I checked methods, processes, tool designs and tools in over 100 plants that were behind on production schedules of vital items. My observations are based on this cross-section of all classes of metalworking plants.

FIRST . . . We still have just as good toolmakers as we did at the turn of the century. That is, as toolmakers are known today. A toolmaker such as Mr. Godfrey refers to is practically out of the picture today. The old toolmaker not only designed (?) his own tools but he did all the machine work on them, did all the hand work on them, and then not only hardened them but set them up in the production machine and made them work. With top toolmakers drawing $7 to $12 for 10 hr of hard honest work, this method was all right for the time. Today a toolmaker does not make a complete tool. Each tool passes through a half dozen to a dozen hands and any one of these men can spoil all the work that has gone before. Each man is a specialist.

SECOND . . . You cannot draw any conclusions from any one plant. A few outstanding plants have tool designers that can really design tools, but the processing engineer would kill any ideas that he did not start. In others, the methods engineer would insist on certain methods, and the tool designer did not have a chance. In others, the tool designers could not design a plain punch with proper clearance. They had no experience and no training in practical work.

To sum up . . . Mr. Godfrey's day of the "good days" is past (along with mine), the day of specialization is here and we may as well face it. If you have a good methods engineer, if you have a good

Toolmakers . . .

process engineer, if you have a good tool designer, and if you have a well-balanced toolmaking department, you get better tools than we could possibly make in the "good old days." You must have a balanced, closely knit engineering organization working directly with your production engineering. But while a toolmaker of Mr. Godfrey's day produced a fine tool in six months, today it is produced without the cut-and-try methods of yesteryear in 10% of the time and lasts ten times as long.

It's a long road since 1899 when I started work for Elwood Haynes as superintendent, then through the half century doing work for over 900 metal-working concerns—always on tool and die troubles. I have been through all the changes of these 50 years. Those "good old days" are gone forever, but, the best days are here to stay and no amount of griping can turn the clock back. Godfrey, you'd better pull in your shingle like I have and go fishing.

EVERYTHING EXPECTED— NOTHING OFFERED

BY LOUIS J. GRUSE, Superintendent
WESTERN FOUNDRY COMPANY

MANY older toolmakers can remember that they entered the trade because of the respect in which it was held when they were young. But what was their apprenticeship like and how did they fare afterward?

As young lads they probably started with little education, and a promise of apprenticeship if an opening should arise. The dawn found the boy sweeping the floor, cleaning spittoons and shining the boss's shoes for the first six months—maybe 12 to 16 hr a day. Overtime pay was never thought of, the starting wage 10 cents per hr and a periodic raise of 5 cents per hr every six months. Now with the label of tool and die maker but still a glorified spittoon cleaner in experience, our "journeyman" shops for a job. His former boss wants him to get some knowledge for himself, admitting he didn't do a very thorough training job on the boy.

In his first interview, our boy toolmaker is asked for his experience. Not being able to offer more than a four-year apprenticeship, he is started at 55 or 60 cents per hour, because to his new shop he is still "a 4th-year apprentice." He accepts and works two years, maybe getting a 5-cent raise, but becomes disgusted and shops again. And for the next 10 years, he is told "no experience" and starts five or six times for 60 cents per hr.

After 10 years of experience, he may have gotten 85 cents per hr. He is a father, his employer gives him overtime when enough work is available but he is just making ends meet. His wife calls him "Boomer Bill." Also, he finds that time lost between jobs more than eats up the benefit of any raise.

When a recession sets in, he is told: "You are now employed on a contract basis. Make this jig or die. Can you build it for $150?" Being a toolmaker and not an estimator, he takes a chance and nets 35 cents per hr. So what, he has to eat and tries again with the same result. He has been proud of his trade all this time, but is now starting to doubt his choice.

With a few dollars in the bank he tries a new angle, buying a decrepit lathe, miller, and shaper for the basement of his home or his garage. Now, he chisels the prices of tools and dies. Other small job shops try to out-quote him. Finally, he can't meet similar "basement-shop" competition, sells out and buys a small chicken farm and works in the city at his trade when work is available.

With the war comes a few lush years, which provide money to improve the chicken farm. Today, with things getting back to normal, our toolmaker finds, after devoting a lifetime to the trade and gaining a wealth of experience, that common labor earns nearly as much per hour as he does.

Top toolmakers of the old school are few but get only $2.00 to $2.25 per hour. Lathe hands are making to $1.97 and machinists $1.90 to $2.00. A toolmaker with all the nerve-racking grief connected with his job may well be better off running a lathe in his declining years and make a vocation of his chicken farm. He won't have much but he will have peace of mind and enjoy a little sunshine and fresh air, which will be appreciated after a lifetime of working in dark, dingy alley shops.

To answer Mr. Godfrey's question: No longer does a young man feel he should make a sacrifice for a vocation. Today we are getting social-minded. Things come gratis to all who howl long enough and hard enough, and the devil take the hindmost. With this trend, how can the toolmaking or any

other profession produce a few honest-to-goodness mechanics not afraid of a day's work? Has anyone tried to hire an apprentice boy today and offer him 20% of a toolmaker's hourly scale? If you have, you know the answer.

NO RESPECT MEANS NO PRIDE —AND NO TOOLMAKERS

BY HARRY S. KIMBALL, Former president, REMINGTON ARMS, AETNA EXPLOSIVES and AMERICAN ZINC, LEAD & SMELTING, Chairman, NRA Code Authority on Fabricated Metals

WHEN, by a series of fortunate circumstances, I was elected president of Remington Arms Co., Inc., it was a routine inspection trip which caused my first visit to the company's plant at Ilion, N. Y., where rifles of the Lee-Enfield design were being produced in large quantities for the British government.

In the office of Mr. Houghton, vice-president in charge of the Ilion plant, I saw old photographs of some fine-looking men, in silk hats and frock coats, whom I took, naturally, to be some of the directors of the company in the earlier days. I was corrected at once by Mr. Houghton, who named them, individually, as either the chief toolmaker, gage maker, fixture maker or jig maker of his time.

My next facetious inquiry was whether their formal dress indicated a Masonic parade or other "dress-up" occasion. Again, I was advised of my error, and told that those highly skilled men—each an artist in his line—came to work in that costume, placed it in his locker, put on his long working frock and did his daily work at the bench. At the end of the day, he walked down the street in his silk hat and frock coat, a highly respected citizen of the town possibly holding office as alderman, member of the common council or in other official capacity in the community. It was an object lesson not to be forgotten.

It is my purpose in recalling this incident to urge employers and workers in the classes indicated to realize their opportunities by creating conditions for such men that will restore as much of the dignity enjoyed by their earlier counterparts in industry as is consistent with changed conditions in modes of dress and other changes in living conditions.

My reasons for this statement may be summarized thus:

1. These men are the ones on which all production depends. Without tools, jigs, fixtures, and gages, there is no production nor work for other employees in the plant.

2. Their daily contact with other factory employees is closer than any possible contact which could be created between management and labor.

3. Restoration of dignity to these men will act as the best possible incentive to others to attain their status. Labor's contact with "front office" or "engineering" is casual. A barrier exists beyond which the average employee does not expect ever to reach.

4. The restored dignity to the father is bound to be reflected in the son, who has felt that work with his hands is menial and less desirable than the white-collar occupations. This keeps many sons from following their fathers (somewhat in the old guild manner) or, at least, from trying to do so. Tradition has been largely forgotten—purposely in most instances—because of loss of dignity of highly skilled men who are now included among all factory workers subject to union conditions.

5. It does not require much imagination to estimate the effect of influence which daily and continuous contact of, say, a comparatively small percentage of skilled workers can have on the rest, either good or bad. The following methods of effecting such Utopian reforms in factory operations are subject to variations as conditions require:

1. Pay salaries—not wages—with additional longevity increases.

2. Establish "white-collar" class benefits of all kinds—vacations, etc.

3. Recognize seniority privileges.

4. Encourage traveling, with expense allowances, for outstanding leaders, for reasonable interchange of ideas with others in similar occupations.

5. Include leaders in front-office conferences on subjects germane to their occupations.

6. Avoid all suspicions of policing of other employees and reporting.

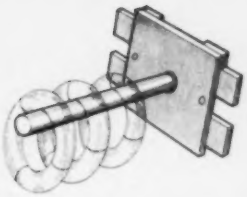
7. Include recommendations with those of superintendent for advancement to their status from "the ranks."

8. Encourage technical schooling.

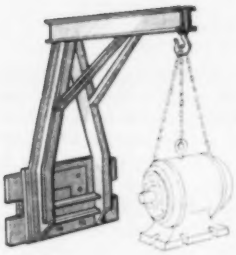
9. Above all—pay more in full-time salaries than previous wages have produced; and remove from any union control.

Among the questions which may be expected, in criticism or approval of these suggestions—irrespective of the facts involved—is whether or not Remington Arms Co., Inc., adopted the procedure. The answer is that it did not do so. The country was at war with Germany. The company's contracts with the government were "cost-plus"; all costs were audited before approval for payment. Even slight increases in cost were not allowed. No recognition of increases, to be reflected in lower total cost, was left to the discretion of the auditors.

When the war ended, and the businessmen who had occupied many top positions in procurement had left government service, all manufacturers were subject to Claims Commissions for final settlement, whose only opportunity for fame was limited to their reduction in final payments to manufacturers, on the slightest technical grounds. This kind of appreciation for our efforts to meet the emergency requirements of the government cost the company nearly two million dollars. This, and being drafted again in another cleanup matter in January, 1920, was my last opportunity with the company to apply the methods which have been suggested; otherwise I should certainly have done so.



Slash Handling Costs by "Tooling" Your Shop Trucks



ATTACHMENTS may well be considered the tooling of industrial trucks. Through attachments, a basic handling machine is set up to do a particular job or a specific class of work. Some attachments are interchangeable; others are permanent installations. However, the latter frequently permit all standard truck operations in addition to the special work that they can do. Thus, with attachments, industrial trucks economically and efficiently perform two or more special operations in addition to their standard functions. In press, machining, and scrap departments, as well as in receiving, shipping, and yard operations, parts and material are handled with fewer manual operations, lower cost for pallets and unit-load carriers, and greatly increased productivity of handling labor. Attachments are applicable not only in shops where volume is high and special devices easily can be justified, but also in smaller shops where an attachment can, in effect, give two trucks for one and thereby a much more versatile piece of handling machinery. And in shops where narrow aisles, low floor-load ratings, and congested areas are a problem, attachments or truck modifications can do much to alleviate the handicaps imposed by these conditions. For both fork and platform equipment, attachments increase versatility, improve effectiveness, and provide an opportunity for increased earnings through greater savings in materials handling.

BY MILES J. ROWAN, ASSOCIATE EDITOR

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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How Can Truck Tooling Benefit You?

FEW executives today know their exact handling costs. Yet many are aware that improved handling methods offer one of their greatest opportunities for savings. As a result, they are focusing their attention on handling operations. What they are finding is this: despite great advances in recent years a surprising amount of handling work is still performed manually—work that could be done mechanically if the proper tool were available. Consequently, materials-handling tooling is in demand, and equipment manufacturers are responding with inexpensive devices that will permit greater mechanization and lower costs in handling operations. Many devices, of course, are developed to overcome a particular problem in a given plant. Yet, as similar problems are encountered in other plants, these units frequently have broad application. In the truck field, numerous devices now are recognized as basic items of truck tooling. And other units, although special developments, often involve a principle that can be applied in modified form to satisfy a variety of related requirements.

From the broad point of view, attachments offer positive advantages in several areas. They will:

1. Provide greater versatility in your handling system. — Attachments are not intended for those jobs that can be done easily, efficiently, and economically with conventional unit-load equipment and methods. Rather, they tool a standard truck to do jobs or to perform operations that are outside the range of trucks with standard forks or platforms. Because of attachments, a greater variety of loads can be handled and more operations can be performed with a single piece of handling equipment.

2. Step up the efficiency of your handling operations.—An attachment is designed for a particular job or class of work. With the right tool for the job, trucks can accomplish their task in the most effective manner.

3 Reduce the number of operations in your handling work.—The additional operations made possible by attachments permit the elimination of some manual operations and of some separate rehandling with other mechanical equipment—some of which is "home-made" for lack of availability of a commercial product.

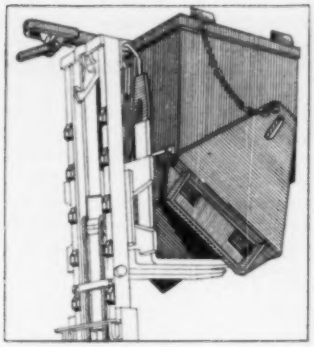
4. Minimize the need for auxiliary handling equipment in your plant. —Some attachments handle loads without pallets, eliminating the expense of obtaining, using, and maintaining these units. Other attachments do work that otherwise requires overhead handling equipment.

5. Aid in overcoming the limitations imposed by your building.—Where space is inadequate for efficient truck operation in accordance with conventional practice, special attachments on truck modifications permit operations from narrow aisles or low floor-load areas and thus permit the adoption of mechanized handling.

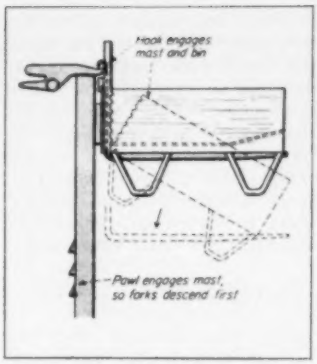
In applying attachments, there are several things to consider. One is interchangeability. Many attachments are readily interchangeable with standard truck forks. Others, that are not interchangeable, involve the use of forks and thus do not prevent the performance of standard truck operations. Their only disadvantage on conventional lifting and tiering operations is that their load rating may be somewhat lower than that of the same type truck with standard forks. This will be true if the attachment causes the center of gravity of the load to be farther in front of the truck axle than is the case with standard forks. A few attachments perform only those special operations for which they are designed and, in effect, are a special truck. Fork trucks, platform trucks, and hand-guided power trucks all can be fitted with attachments.

Tooling Pays For Itself

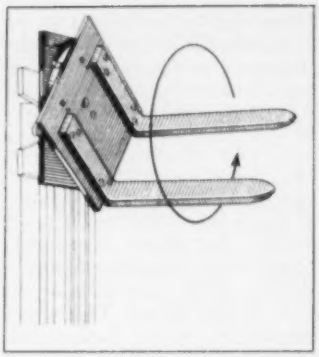
Described in this report are those units that are of greatest interest and of broadest usefulness to the metalworking industries. Where possible, the material is grouped according to the major purpose accomplished by the attachment. The devices shown, however, by no means exhaust the possibilities inherent in truck tooling. The variations that can be developed are virtually unlimited and it is advisable for those who need an attachment to consult with equipment manufacturers to draw upon their knowledge and experience in obtaining the best practical tool for the job. As the price of handling labor has increased faster than the price of trucks, an investment can be liquidated sooner today than at any previous time.



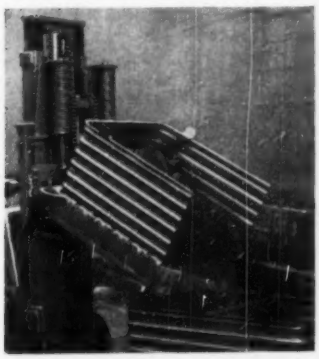
Bottom-dump hopper is supported at top rear; lowering forks permits hinged bottom to swing open so load falls free



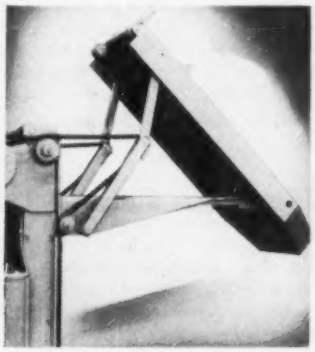
End-dump skid bin pivots about support at bottom rear to discharge parts by gravity as truck forks are lowered. Support engages rim of bin



Revolving carriage turns bins or containers upside down and permits dumping at any height within full range of fork-lift truck



Powered dumping attachment has hydraulic cylinder that raises hooks engaging rings at end of box against action of coil springs



Tilting mechanism permits end-dumping operations with platform truck. Bracket on top surface of platform holds open-end bin

Scrap is dumped directly into truck without rehandling and without additional equipment at loading point. Truck has revolving carriage

Self-Dumping Units Eliminate Manual Unloading

ELIMINATING the need for removing material from skid boxes manually are several attachments that permit dumping the entire load in one operation. These can be applied to any operations in which it is necessary to transfer parts or materials from one container to another without the need of packing, prepositioning, or careful handling. Small castings, forgings, stampings, and some machined parts lend themselves to this method of handling. Hoppers that deliver parts within easy reach of the operator can be replenished with self-dumping units and scrap handling is a major application. By replacing hand-unloading operations, these attachments not only save time and reduce cost, but also improve working conditions by reducing the possibilities for cut hands and pinched fingers. Further, by adding dumping to the standard lift-truck actions, self-dumping devices reduce the opportunity for delays and temporary storages of material in process, eliminate the need for other lifting or positioning equipment at the unloading point, and often cancel two or more operations required for rehandling if bins are dumped by other methods.

Drop-Bottom Skid Bin—One of the simplest units is designed for use with drop-bottom skid bins. As the forks raise the bin, a hook on the truck mast engages a large eye or similar support attached near the top edge of the bin on the end to which the bottom is hinged. Lowering the forks permits the bottom to open, with the angle to which the bin bottom is lowered, controlling the discharge rate from the bin. When empty, the bin is closed by raising the forks and is released from the hook by a control at the operator's station. Dumping can be performed over the full ele-

vating range of the truck. This can be accomplished by a pawl arrangement on the truck that engages brackets on the mast to hold it in the elevated position and permit the fork carrier to descend first.

End-Dump Skid Bin—For gravity dumping, this system also employs a hook on the truck to hold the bin during the dumping operation. But, unlike the previous method, the hook engages the bin at its bottom rear edge so the bin pivots around this center as the forks are lowered. Parts simply slide from the open end of the bin. Otherwise, the operation of this unit is similar to that of the drop-bottom attachment.

A second device for dumping open-end skid bins employs a hydraulic mechanism that tilts the bin at any elevated position on the truck mast. Hooks engage rings fitted at the rear of the bin. To tilt, a double-acting hydraulic cylinder lifts the hooks against coil springs that assist in returning the bin to the horizontal position when dumping is complete. The bin is disengaged simply by lowering it to the floor. This unit provides full control over the operation and complete flexibility in dumping action. Although a special development, this truck also can perform standard fork-truck operations.

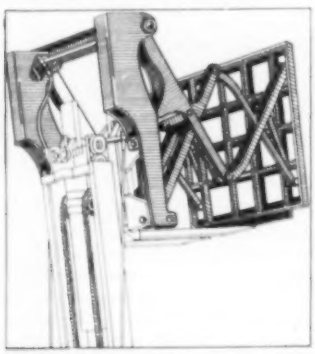
Revolving Carriage—These attachments contain a mechanism that rotates fixed forks or other load carriers to turn skid bins upside down for emptying. Providing complete flexibility in dumping, revolving attachments operate at any height over the full lifting range of the truck. Bins for the operation are made with tubes or pockets in which the truck forks are positioned, to prevent bins from falling when in the inverted position. Trucks with a revolving carriage also can perform all standard fork-truck operations. Although their basic function is the same, revolving attachments by different manufacturers vary considerably. Some rotate only 180°; others 360° in one direction only, and still others turn the full circle in either direction. Some must be factory installed; others are readily interchangeable. Rotation usually is by hydraulic or electric power through a bull-gear drive.

Platform Dumping Units—Platform, as well as fork-lift trucks, also can be made to perform dumping operations. Hooks can be employed for bottom-dumping, and end-dumping is accomplished by tilting the entire platform while in the elevated position. In similar manner, the entire platform can be tilted sideways for dumping at right angles to an aisle. Hardware, fittings, and other parts that can stand rough handling can be dumped directly into bins.

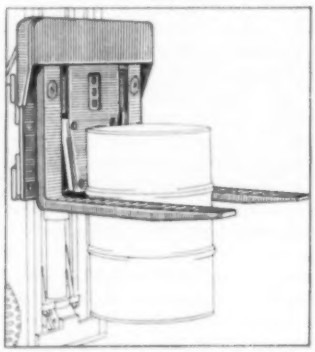
Several Devices Handle Loads Without Pallets

Pusher Devices—The handling of cartons, boxes, crates, barrels, and bags in multiple units without pallets is possible with several attachments containing hydraulically operated pusher mechanisms. In the unloading operation, the pusher advances to hold the load in position and at the same time the truck backs away until the forks are completely withdrawn from the load. With attachments of this type, goods that normally are shipped unpalletized can be loaded into freight cars and highway trucks without manual handling. As loads consisting of several individual items can be pushed into position in one operation, cars can be loaded with pusher units in a fraction of the time required when items are lifted and piled individually. Similarly, large savings are possible in positioning unpalletized loads in the warehouse or storage section.

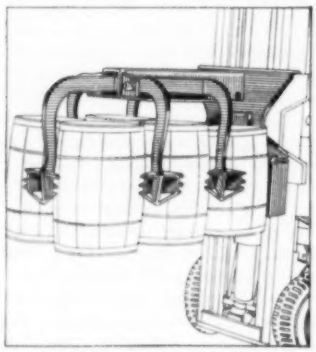
In operating with these attachments, several different systems for assembling the load are employed. Some loads—such as boxes



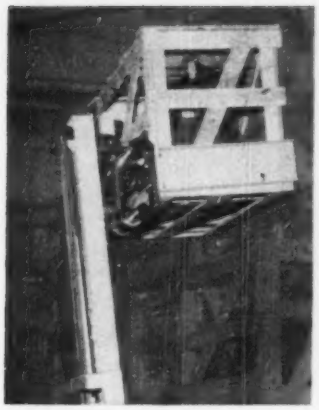
Pusher attachment shoves unpalletized loads from forks or from load carrier on which cartons, packages, or boxes can be assembled



Pivoting forks swing about mounting point to move into position under projections on boxes, barrels or other units. Forks also grasp load

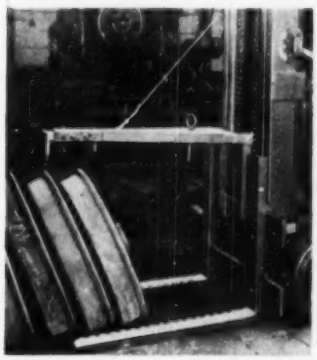


Keg handler has hydraulically operated gripping arms that suspend six equal-size kegs or cylindrical objects for transporting and tiering



Side-clamping arms with spike faces exert sufficient pressure on crate containing assembled engines to permit lifting and tiering operations

Scoop attachment picks up load of bagged castings by driving into pile. Pusher shoves bags off scoop at unloading point



Car-wheel handler has notched forks which are moved into arc between wheel and floor for lifting. Overhead bracket is hinged for unloading

and crates that are strong enough so forks can be pushed under them, and yet do not slide away during the operation—can be picked up directly on the truck forks. Where this is not possible, items are piled on a carrier plate that permit entry of the truck forks for the lifting operation. During unloading, a locking device holds the plate on the forks and prevents it from being pushed off with the load. Another method is to pick up the load directly on the forks by means of a "take-it-or-leave-it" pallet. And a third device pushes the load directly from the pallet itself. During unloading, arms located between the forks grip the center post of the pallet to hold the pallet on the forks. With these systems, the truck can be used for all standard fork-truck operations involving pallets or other unit-load carriers. However, assembled loads cannot be picked up mechanically once they have been pushed from the plate, forks, or pallet.

Push-Pull Units — Intended for both picking up and depositing unpalletized loads is a pusher unit that also contains gripping jaws so loads can be pulled onto the truck with the return stroke of the pusher. In this method, units are piled on carrier sheets of corrugated paper board, fiber board, or similar materials. The gripping jaws then clamp the edge of the carrier sheet and pull it onto the truck. In unloading, the carrier sheet is pushed off the truck with the load.

Pivoting Forks—Also capable of handling without pallets are attachments on which each fork pivots around its support through a maximum arc of about 10°. Items that have projecting surfaces against which lifting can be done can be handled readily with these units. As the fork rotation is fully controllable throughout the arc, the forks can be adjusted quickly to any object within a broad range. Drums, lead pigs, and tote boxes are among the major items. To pick up a load, the truck is maneuvered so the load is between the forks; the forks then are closed until they hold the object in a pincer-like grasp. Curved arms can be mounted on the forks for drum handling and standard pallet lifts also can be made.

Side-Clamping Arms — Handling without pallets also is possible with a side-clamping attachment. Loads are not supported on forks, but are held between two arms that exert sufficient pressure on the sides of the load to permit normal lifting, carrying, and tiering operations without further support. Clamping is accomplished hydraulically by arms that move across the carriage with straight-line motion in the horizontal plane. Arms are readily interchangeable and standard styles include rubber-faced, spike-faced, carton-handling, drum-handling, and pallet load arms. The latter lifts in the same way as a standard set of forks.

Top-Clamping Arms—For objects that do not make a palletized load that is steady enough for safe transport, parallel arms that pivot in a vertical plane about their mounting at the top of the truck carriage can be applied. Pressure is exerted equally and simultaneously at the top of the load down against the forks. Overhead supporting frames serve the same purpose on platform trucks.

Drum-Handling Devices — Curved arms for side-clamping and pivoting-fork attachments are well suited to handling drums of oil, coolant or other fluids where drums are received in moderate numbers; they do the job efficiently, yet easily can be converted to other work. For large-quantity drum handling, several attachments lift and move units in multiple. Another single-drum unit hooks the top rim of the drum to tilt it backward as formed support shoes advance into opening between bottom rim and floor to secure control over drum. For dumping open-end drums, a revolving carriage can be equipped with hydraulically operated curved arms that grip the drum securely in all positions.

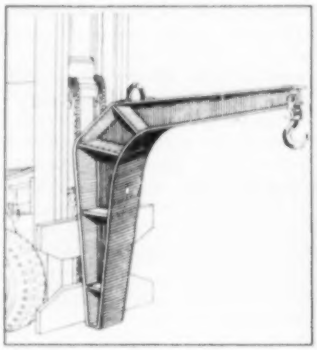
Shovel Scoops—Scoop attachments provide an efficient means of picking up, moving, and dumping

loose or free-flowing materials. Compact and highly maneuverable, scoop-equipped trucks are particularly well adapted to operating in close quarters at shipping docks or in storage areas, for handling moderate quantities for which larger, more expensive equipment is not practical, and for working in relatively inaccessible areas in which the operation otherwise would be done by hand. Coal, sand, and bulk scrap—such as turnings, punchings, and flash—are among the material that can be handled quickly and easily in this way.

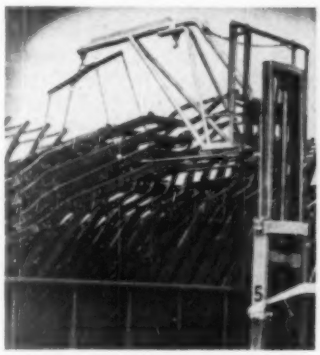
Some scoops are hydraulically operated; others are purely mechanical in action. Both types are loaded simply by moving the truck forward to force the scoop into the pile. With the mechanical type, dumping is entirely by gravity, with the operator simply tripping a control to release spring-actuated catches that hold the scoop in the horizontal position. Lowering the scoop to the floor automatically resets the catches. For traveling with the loaded scoop, the truck mast is tilted backwards to minimize spillage. Some units also are equipped with a pivoted scoop-gate for the same purpose. With the hydraulic unit, the scoop can be rotated through an arc of approximately 160° independently of the lifting action of the truck. The scoop can be turned upward for traveling, downward for dumping at any rate of discharge, and is completely under the control of the operator at all times.

Also designed for self-dumping are large hopper attachments. After emptying the hopper automatically returns and latches itself in the upright position.

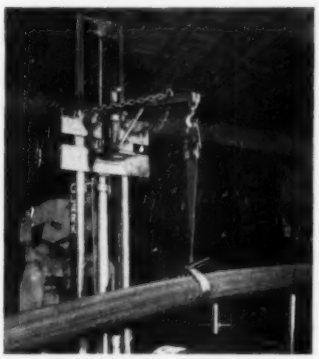
Booms and Rams Handle Odd-Shaped Loads



Boom attachment provides mobile lifting and hoisting service in all areas accessible to industrial trucks



Extension boom equipped with sling unloads auto frames four at a time. Truck maneuvers to obtain load



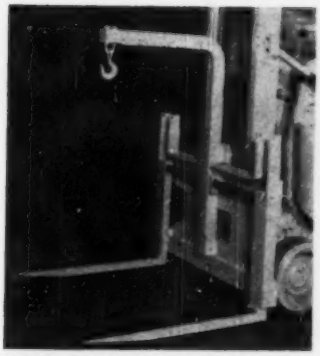
Shop-made jib crane with wire-mesh sling pulls bars from rack and loads trailer in low-headroom area

ITEMS that do not lend themselves to palletizing and have no surface satisfactory for fork or platform lifting form the major applications for boom attachments. Included are bars; tubes; and large irregularly-shaped castings, weldments, or assemblies that can be handled as suspended loads. Providing a limited, but mobile, hoisting service, trucks equipped with booms are particularly useful for receiving and yard work; for those plant areas where the volume of heavy lifting is not sufficient to justify fixed overhead installations or where low head room is an obstacle; and for the occasional lifting job such as machine installation and repair.

Standard crane attachments include both the fixed and swinging booms, and are readily removable. In addition, many special units have been developed by users and these frequently are designed to slip over the standard forks for quick change-over from one class of work to the other.

Boom Attachments — The fixed boom is rigidly mounted on the truck carriage and carries a load hook at its extreme end. Lifting and lowering is done by raising or lowering the carriage, spotting and positioning by manuevering the truck, or swinging the load. Some booms have an adjustable member to extend their reach.

Ram attachment is inserted in opening in heavy weldment to move part without need of overhead equipment. Rams handle many open-center loads



Combined boom and fork attachment has forks that pivot around mounting bar to a position 180° from that shown to provide free area in front of truck for operations requiring boom

The swinging boom pivots on its mounting through an arc of 180°. As suspended loads can be placed at any position up to a right-angle with the truck, the swinging boom is an advantage in areas where there is not enough space for maneuvering. Booms also are made with the hook attached to a load cable that is fastened to the bottom of the truck mast and extends up through the boom. The load then moves double the travel of the mast. Platform trucks also can be equipped with booms, although some of these are not removable.

Ram Attachments — Among the widely used attachments that are readily interchangeable with standard forks are rams and extension forks. Rams commonly handle "open-center" loads such as large pipe, wheel castings, and coils of wire, rod, or strip. But they also can be applied to an irregularly shaped part with an opening large enough for the ram. Unloading normally is accomplished by lowering the ram until the load supports its own weight, after which the truck backs away. However, pusher attachments can be added to the ram unit.

Fork Extensions—Fork extensions can be mounted quickly and easily on standard forks to permit the handling of loads that are within the capacity of the truck, but are of exceptional size. The extension is slipped over the regular fork and anchored at the heel so it will not slip forward, backward, or sideways. Thus, long loads can be handled yet the truck still retains the maneuverability of which it is capable on all jobs that can be handled with forks of standard length. The attaching operation can be performed quickly and easily.

Miscellaneous Attachments Serve Varied Needs

Oven-Charging Unit — A particularly interesting device for the metalworking industries is a truck equipped for loading castings into heat-treating ovens. A heat-resistant windshield of bluecolored glass protects the driver from the heat of the furnace and fender guards protect the tires. A double set of forks permits the loading of two containers of castings at one time. If desired, the two sets of forks can be locked together and operated as a single set of forks.

Side Shifter—With a side shifter, the lifting carriage can be moved laterally several inches to either side of the center of the truck. As truck forks can be properly positioned in a pallet or unit load without carefully positioning the truck, side shifters often speed truck operations by reducing the need for truck maneuvering. This feature is particularly valuable in narrow aisles or close quarters. Side shifters also permit very close positioning of loads quickly and with little trouble for the operator. Valuable warehouse space can thus be saved without sacrificing normal operating speed. Car loading also is easier.

Safety Attachments—Two attachments that are important in truck operation, although they do not directly affect the operating capabilities of the truck, are the extension back rest and the overhead guard. The former steadies multi-unit loads that project above the standard lifting carriage. The back rest provides better support when the load is tilted back in transit and permits high-tiering with normal safety. The guard protects the operator against injury from falling objects. Both contribute to safe operation and fewer handling injuries.

Other Attachments — Many variations in attachments or truck modifications are possible. Special attachments, of course, create problems of loading and truck stability, particularly if tiering or high lifts are required. Experience and technical competence are essential for a practical solution at minimum cost. Users should take advantage of the engineering service of equipment manufacturers to insure getting the best truck and attachment for the work.

Simple ram-unit consists of T-section with curved top plate. Forks are moved close together, T-section fits between forks, and curved plate covers edges of forks to prevent damage to wire during handling operation

Acknowledgment

We gratefully acknowledge the assistance of the following companies in the preparation of this report:

Automatic Transportation Co.
Baker-Raulang Co.
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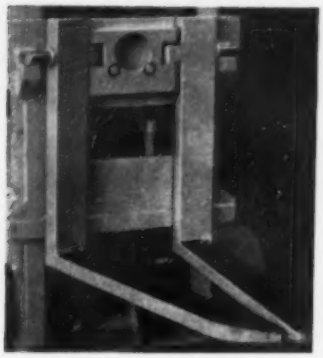
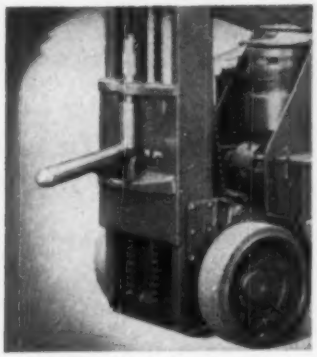
Hyster Co.
Lewis-Shepard Products, Inc.
Mansaver Industries, Inc.
Towmotor Corp.
Yale & Towne Mfg. Co.

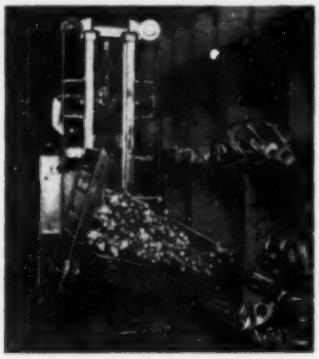
These Units Operate in Narrow Aisles and Congested Areas



Hinged forks permit shorter turn when removing forks from pallet carrier after load is deposited.

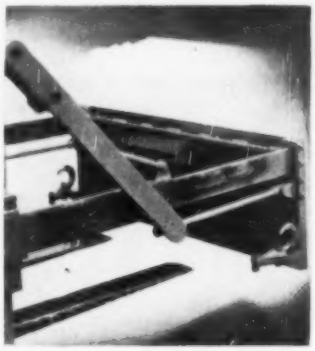


Swinging ram makes it possible to position ram in load without turning truck as much as with fixed ram

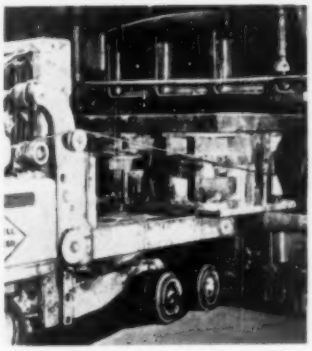


Side-dumping attachment on platform operates in narrow aisle to dump parts without maneuvering truck

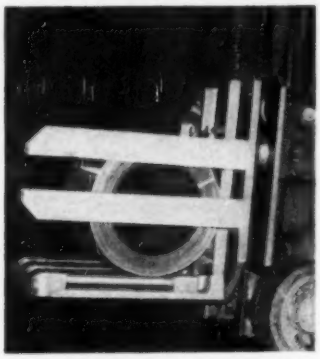
Attachments and Truck Modifications Serve Press Rooms



Die handler on fork truck is equipped with hooks to pull dies onto forks. Pusher performs unloading operation



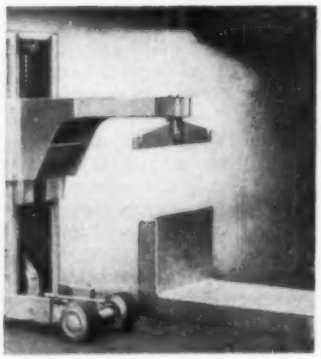
Die handler on platform truck will carry loads as high as 100,000 lb. Winches operate cables to move dies



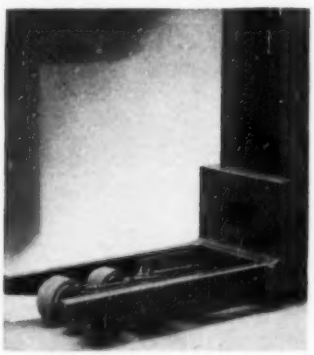
Coil stock up-ender picks up coils and rotates them for storage or positioning at presses. Forks have rollers

Tooling Adapts Platform Trucks to Special Requirements

Hinged platform shortens over-all truck length for riding on small elevator in old multi-story building



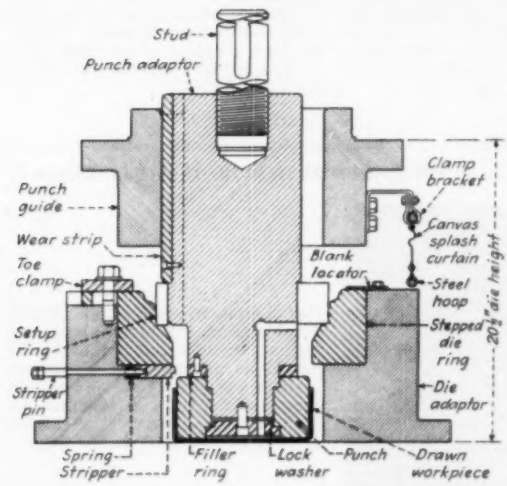
Boom attachment equipped with yoke is interchangeable with platform on high-lift truck



Fork attachment on high-lift truck permits limited tiering with lower concentrated floor load from truck

Steel blanks are lime-coated by dipping to prevent galling, then placed in dies in 400-ton Toledo toggle press. The blankholder is used only to approach the punch guide toward the die before the ram descends

Stepped Die Draws Heavy Brake Drums



Drawing pressure requirements for the brake drum were reduced by machining three radiused steps in the draw ring. This ring, the punch and die adaptors and the punch guide are made of cast iron. An air-escape channel is drilled into the washer holding the tool-steel punch and likewise through the punch adapter

BY H. A. WALDON,
General Superintendent
JOHN DEERE WATERLOO TRACTOR WORKS

THREE radiused steps are machined in the die ring used at John Deere Waterloo Tractor Works for drawing tractor brake drums from ¼-in. thick, 14¼-in. dia hot rolled steel blanks. Walls of these drums are so smooth after the single drawing operation that they need not be machined before use.

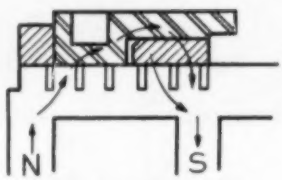
Blanks are pickled and lime coated with expended carbide from plants' acetylene generators before drawing, and clearance between punch and die is 0.012 to 0.015 in. less than metal thickness. As a result, the sidewalls of the cup are ironed smooth during the single drawing operation.

Round blanks are delivered to the press on lift-truck platforms and individually are dipped in a lime-water solution just before drawing. At the rear of the press is a drag chain conveyor-elevator, which automatically lifts the drawn cups from under the press and delivers them to lift-truck boxes. Press speed is seven strokes per minute, and the operator has no difficulty maintaining this rate of production.

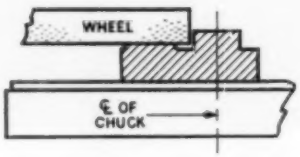
SURFACE GRINDING WITHOUT EXPENSIVE FIXTURES

Odd shapes and unusual contours often cause chucking difficulties. In mass production, the solution is usually a special fixture, but ingenuity will do the job cheaper for toolrooms and job shops. Here, in pictures, are typical smart solutions

BY HAROLD F. SKILLINGS, Service Manager, The Blanchard Machine Company, Cambridge, Mass.



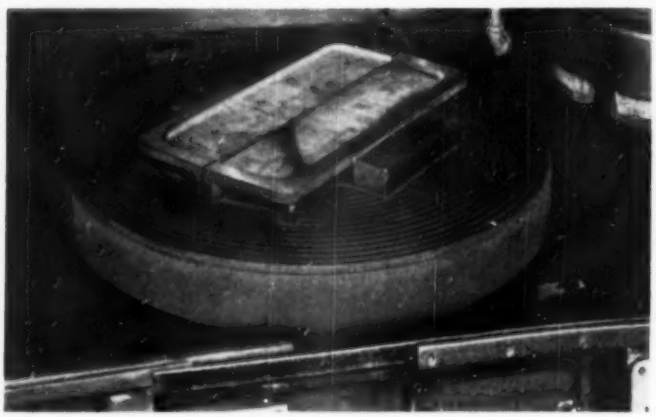
Unbalanced Part—This part has parallel surfaces but requires additional support for the overhang and to resist wheel pressure. Blocking provides this support and increases the magnetized base surface. Downward wheel pressure adds to the holding force, but sideward wheel forces must always be counteracted by proper side blocking



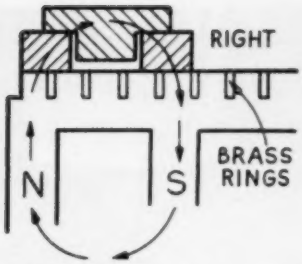
Projecting Element — By placing a projecting hub over the chuck center and feeding the chuck under the grinding wheel only far enough to grind the flat surface, a normally "impossible" job can be ground successfully. When the piece is turned over, blocking would be used to lift it high enough to clear the projecting hub above the chuck

Many Projecting Parts—When a large quantity of parts with projecting hubs are to be ground, a nonmagnetic metal body can be used as an auxiliary plate, with steel pins sweated in place to match the steel poles of the chuck. The plate top can then be profiled or provided with pockets to suit the parts. Note use of pin to center hub

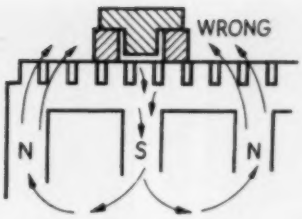
Principles shown in sketches above



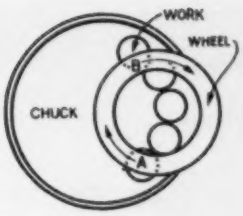
Rough Castings—Blocks supporting rough castings should have large contact areas, or a number of blocks should be used. Several like rough castings will usually vary enough so that blocking must be changed for each. Adjusting screws, as shown here at corners, will do the trick



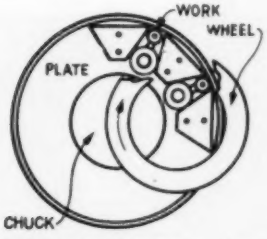
Right Location Helps—Full magnetic pull can be obtained only by locating work between opposite poles. Non-magnetic brass rings in the chuck act as dams between poles, to aid in causing magnetic force to travel through the workpiece. With work and blocking supports properly placed, the magnetism will grip the work with maximum pull



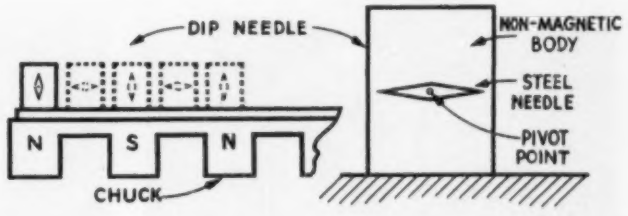
Wrong Location—Placing the piece directly over one pole results in major loss in magnetic pull. Whether blocking is necessary or not, the piece should be spotted between two opposite poles rather than above one or the other. For effective holding, the operator must have some knowledge of magnetism and of chuck construction



Thin Parts—Grinding action of the wheel may be enough to move thin parts—toward the chuck center at A, and off the chuck at B. If the wheelhead is tilted just enough to clear point A, no measurable error from a true flat surface will result and a single outside ring will be enough to block the work from sliding. If quantities are large, use a nest plate



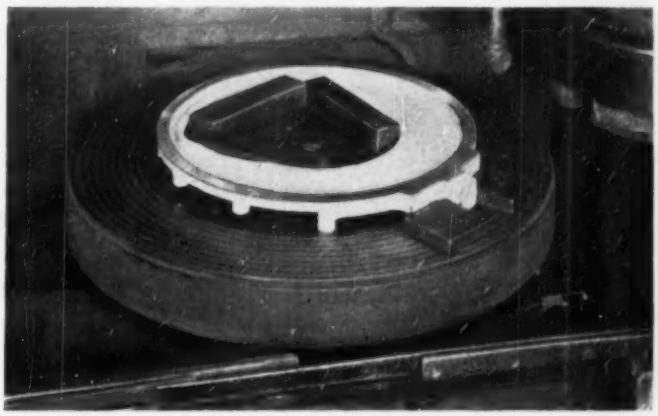
Bolted Work—Bolt pieces, if necessary, either through bolt holes provided in the chuck, or into separate steel or iron rings or plates held on the chuck by magnetism. Here V-shaped blocks are bolted to a plate and work wedged into the openings—very effective for non-magnetic parts if the wheelhead is tilted to wedge the work as previously described



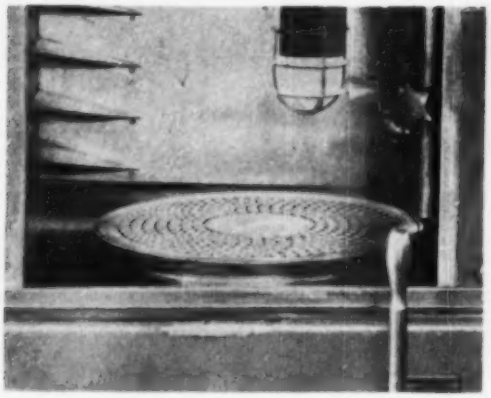
Handy Aid—A simple "dip needle"—really a steel needle on a horizontal rather than a vertical pivot, will dip as shown at each north or south pole as it is pushed across the chuck with chuck current on. Thus the operator can find the poles and spot work between them to be certain of maximum gripping power for any specific job he may have to do

are illustrated in these and following pictures

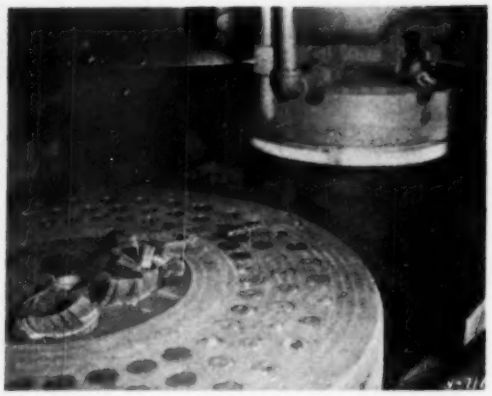
Large Non-Magnetic Pieces—Non-magnetic parts require blocking to hold them against forces of wheel and chuck only, meaning generous blocking on ID and OD. Wheel pressure and its own weight will hold work down against the chuck



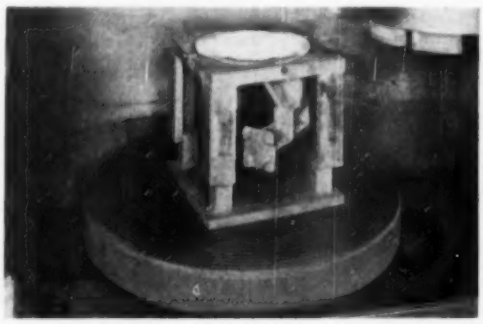
Additional examples on following pages



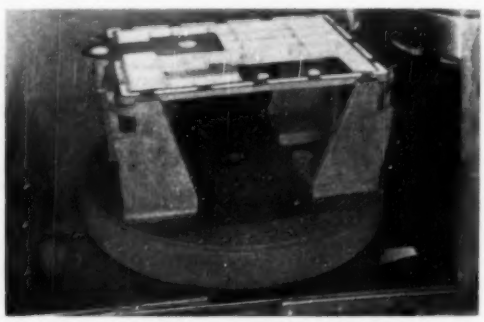
Blocking Small Pieces—To counteract the tendency of the grinding action of the wheel to move parts on the chuck, blocking rings may be used. Here two rings (supplied with the machine) block the small disks and hold them in contact with each other



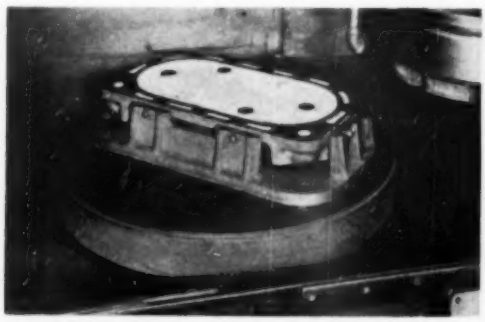
Difficult Shapes—Small pieces that do not block well can be nested in holes in a non-magnetic masking plate located to position workpieces over the strongest parts of the chuck. Here, small thing gears, like those strung on wires at the middle, are nested



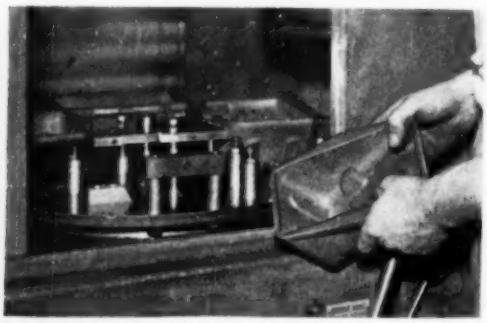
Odd-Shaped Pieces in Lots—For small lots, a fixture fabricated from scrap may work very well. Here a very complicated piece is supported on the flange under the ground surface and four screws grip the flange OD. The fixture is held in turn by magnetism



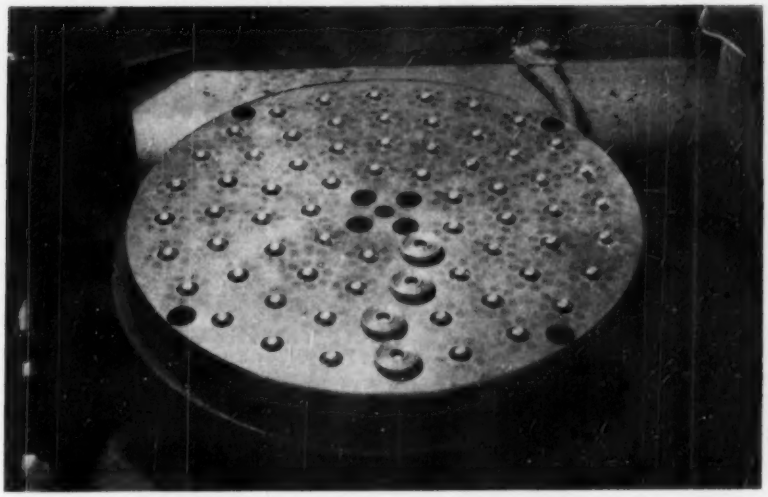
Large Unequal Castings—Here a simple fixture provides locating pins at three corners and an adjusting screw at the fourth for leveling irregular castings, while two screws at each corner provide grip. The fixture is really four identical separate castings, so can handle a variety



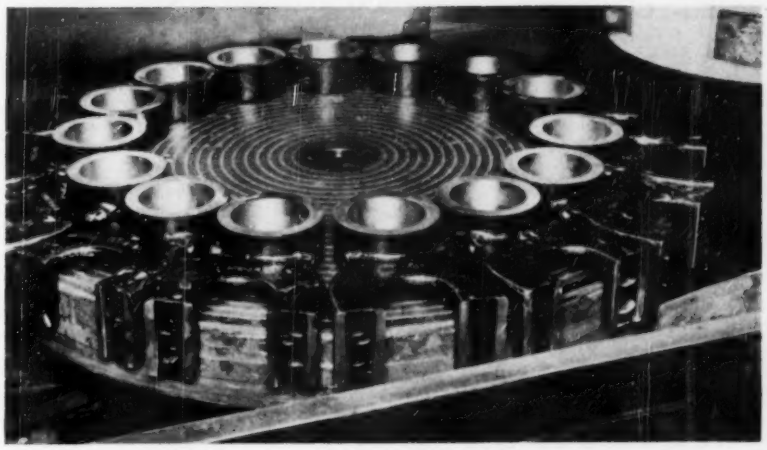
Heavy Unequal Castings—Here a fixture with ears has been cast to hold heavy and varying castings. Both positioning and clamping screws are provided, so non-magnetic pieces can be held securely, while the fixture is held by magnetism only



Box Castings—By putting fixed locating plates and a few adjustable bolts for positioning the work atop a mounting plate, four castings can be ground at once. The plate covers the whole chuck surface. A little ingenuity will produce such a chuck for almost any part



Small Pieces With Projections — If many small pieces have projections, a non-magnetic auxiliary plate can be made. This one has steel pins for locating in the piece bore and steel flush pins around it to aid in gripping pieces



Interfering Projections — By hanging projections over the chuck edge, the pieces in this instance block each other and do not interfere with the chuck. No auxiliary blocking is required and pieces are held securely, although it may be necessary to adjust the column so grinding pressure is against the chuck center

REMEMBER

1. Magnetism adds weight to the work, thereby increasing friction between work and chuck.

2. Magnetic pull decreases with part volume.

3. Steel or cast-iron blocks or rings can frequently be substituted for expensive fixtures on a magnetic chuck. Such blocking must be ground all over to close limits for squareness and parallelism to assure good magnetic contact. Dimensions should be marked on blocking for ready reference.

4. A "grease-board transfer" will increase production of very small pieces. Mark a platen or flat bench to match the chuck and have the operator set up a second load in this area while the machine is grinding the first. When the first load is removed, he simply places a greased board over the second load. Pieces will stick to the board, so can be carried to the chuck as a placed group. Pieces are placed, magnetism turned on and board removed, then blocking rings are placed.

5. Parts with a projecting boss which interferes with normal chucking can be supported on two or more blocks or rings of equal height. If these are not available, they should be made before mounting pieces. This can be a tremendous time saver when a group of like parts is to be ground.

6. Several like parts in a single chucking should touch each other so they supply their own side blocking, if it can be done without reducing magnetic efficiency too greatly.

SHRINK FITTING TOOK ONLY 15 SECONDS...

. . . but carefully scheduled heating and cooling took 2300 times as long, plus countless hours of anticipating trouble and planning to avoid it in that vital quarter minute. Being the chronicle of how to line a 26⅝-in. cylinder 8½ ft long—and how to avoid aspirins on any split-second job

First Came the Planning . . .

No complex football play was ever executed with more coordination—or planned more carefully in advance—than the recent shrinking of a big 4500-lb steel cylinder around its bronze liner at the Sunnyvale, Calif., plant of Westinghouse Electric Corporation. The cylinder is the main part of the operating mechanism of a large 13-ft butterfly valve, one of four identical units for the new Cresta and Rock Creek hydroelectric stations being constructed on the Feather River by Pacific Gas & Electric Company.

Shrink fitting presented unusual problems in this case because of sheer size of pieces involved. Before shrinking of the first cylinder was attempted, extensive discussions were carried on between plant engineers, production men and inspectors. The method finally chosen combined techniques already used successfully at the plant with large gears and turbine disks.

With both pieces at ambient temperature, the "interference"—or amount the liner's outside dimension was larger than the cylinder's inside dimension—was from 0.007 to 0.011 in. To expand the outside cylinder sufficiently to enable it to be slipped over the liner, it was decided to heat the cylinder to 350 F above ambient temperature. With due allowance for a slight drop in temperature as soon as the cylinder was removed from the oven, it was computed that the inside dimension would thus be increased by more than 0.050 in.

This clearance, ordinarily ample for shrink fitting smaller units, did not provide much leeway for the long "drop" over the liner, which stands 8 ft 6½ in. high and has a diameter of 26⅝ in.

Furthermore, the problem was complicated greatly by the considerable difference in the coefficients of expansion between the two metals. This factor, for the bronze liner, was 0.000013, almost twice that of the cast-steel cylinder. Accordingly, there was the danger that the heat from the steel would be transmitted to the bronze so rapidly that the two units might "freeze" together irrevocably while the cylinder was in the process of being over the liner.

Even when the two units were in place, there was the possibility that the bronze might be heated sufficiently to cause it to overexpand within the steel cylinder. This would cause the liner to "buckle" so its inside surface would be wavy. In addition, such an expansion against the stronger metal might "crush" the bronze—that is, destroy its characteristics so its diameter would be affected. This mechanical change in the liner would make it loose within the cylinder when both metals finally had cooled.

As a possible means of eliminating some of these problems, consideration had been given to cooling the liner instead of heating the cylinder. However, this method, which works well on smaller units, was not considered feasible in this case. The smaller clearance from contraction of the liner was regarded as inadequate for the long "drop" required. Even for such small clearance, an enormous quantity of solid carbon dioxide would have been required to pack the liner. Successful execution of the job, it became apparent, would require heating the cylinder—but keeping the bronze liner cool inside.

A further problem to consider was that of longitudinal expansion and contraction of the metal. The cylinder would gain considerably in length when heated—about 3/16 in. If the cylinder were to cool all over at the same time, it would grip the liner at both ends, and the effect would be to "telescope" the liner as it cooled, to a degree which would buckle the liner's inside face.

As a result, it was decided that, while the entire liner would be kept cool after the cylinder was slipped over it, the cylinder would be cooled first in the middle, then gradually toward both ends. This would enable the steel to grip the bronze in such a way that the cylinder's length would be approximately normal by the time its two ends contracted.

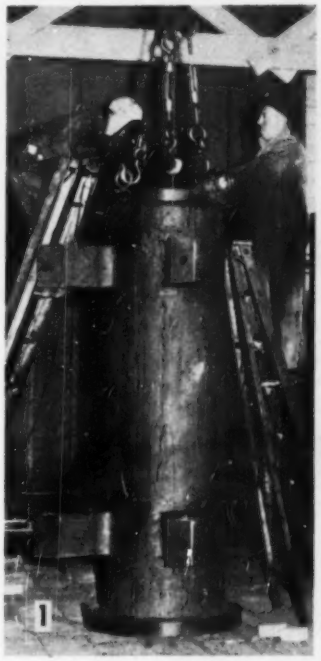
Three Critical Steps

The three critical parts of the job, then, were: first, to place the heated cylinder over the liner as quickly as possible, in order to have maximum working clearance; second, to keep the liner cool; and third, to cool the cylinder from the middle out.

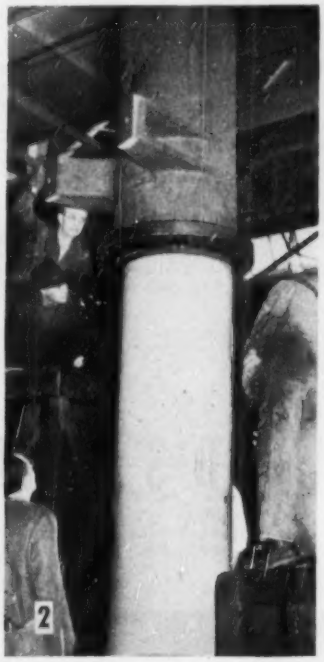
Before any attempt was made to shrink the cylinder around the liner the first time, all personnel concerned in the operation were carefully instructed in the entire process. In effect, they were "rehearsed" to do the job with virtually split-second timing. The dispatch with which the job was done—on the first unit and subsequently on three identical ones—was attributed to the great amount of advance preparation.

AFTER PLANNING, REHEARSING, AND HEATING, FITTING WAS A 15-SECOND CINCH

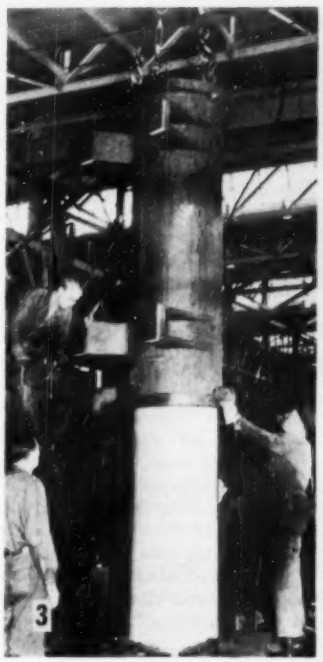
1 **Hot and Ready** — From ladders placed against the 4500-lb cast-steel cylinder, J. L. Archibald (left) and Ray Andree hook up the rigging. A 3-hook rig was used, with Archibald adjusting turnbuckles on two cables for exact level which Andree checked. Speed was essential to keep heat loss at a minimum from the piece, lengthened 3/16 in. and expanded in diameter more than 0.050 in. by heating to 410 F. Soak heating took 9 hr in a gas-fired furnace, 5 hr to come up to heat and 4 hr of soaking to equalize temperature. The cylinder was heated in this position on the furnace car



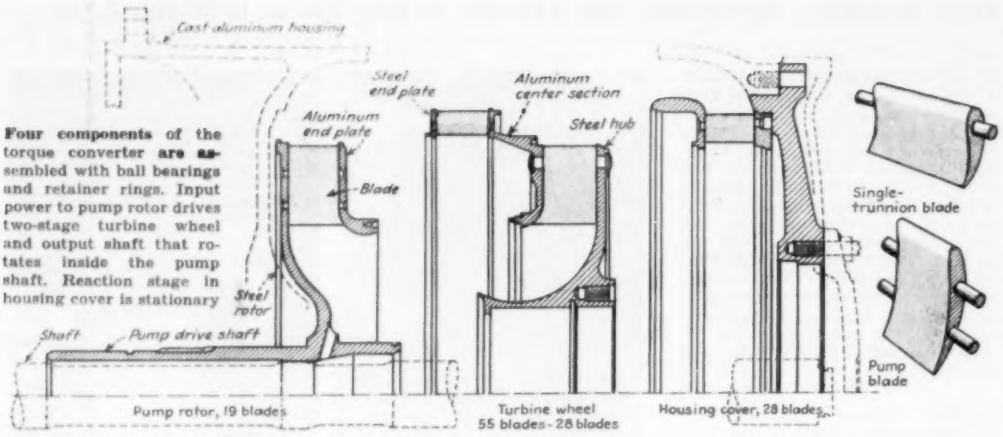
2 **Final Aligning** — Meantime the bronze liner, 8 ft 6½ in. long, had been equipped with end plates, set up and leveled on the hydraulic testing stage 100 ft from the furnace, coated with an "anti-seize" lubricating compound, and filled with water from a lower pipe. While its two guardian angels and an engineer sight from various angles, Rigger John Ascunsion (wearing hat, on stage) brings the big heated cylinder into exact position for the drop. It is held carefully just above the liner, because if it touched, the liner rim would be heated locally enough to cause seizure



3 **Vital 15 Sec**—Once the drop was started, nothing could be allowed to stop it—or the stop would be permanent. Thus, total fitting time was only 15 sec. This photo was taken after about 5 sec. Clearance between liner and cylinder was only about 1/40 in. on a side initially, and the coefficient of expansion of bronze is about twice that of steel, so fitting had to be done before the bronze liner could absorb any great amount of heat from the cylinder passing over it



4 **Cooling Was Vital, Too**—As soon as the cylinder was in position, Archibald attached an outlet pipe to the nipple and elbow on the liner cap, so Andree could start water flow inside. Then Archibald detached the rigging while Andree and a partner began playing hose streams at the middle of the cylinder so it cooled there quickly, thus gripping the liner at the midsection first. Time from furnace to finish was less than 7 min, but cooling took an additional half hour



Four components of the torque converter are assembled with ball bearings and retainer rings. Input power to pump rotor drives two-stage turbine wheel and output shaft that rotates inside the pump shaft. Reaction stage in housing cover is stationary

WOOD'S METAL REPLACES ASSEMBLY FIXTURES

Turbine blades for hydraulic torque converters are set in place with low-melting-point alloy instead of complicated fixtures. Result: no adjustments, plenty of speed, reduced costs

BY BEN C. BROSHEER, ASSOCIATE EDITOR

CLOSE blade position is the key to efficient torque-converter performance in GMC coach transmissions. While blades for the first hydraulic stage—a pump rotor—are positively located because each blade has two trunnions, or rivet extensions, on each edge; blades for the other stages are made with only one trunnion on an edge.

Trunnions are hollow-milled to fit drilled and reamed holes in their retainers. Those with single trunnions are assembled to their retainers in slotted fixtures that position the blades correctly. To prevent any dislocation of the blades before they have been riveted rigidly in place, the fixture is covered and Wood's metal is poured over all the blades from an electric solder pot.

Removal from the fixture is made easy—after the alloy has set—by a lever arrangement that forces small pins up through the locating holes in the retainers. The pins raise the alloy-laden assembly by lifting the blade trunnions.

Blades are fixed in their retainers by a 500-kva welder equipped with an air cylinder. Welding heat softens the trunnion extensions, but not the soft alloy, and the cylinder heads them to form rivets. Hand-indexing around the circular welding jig shifts all the blades under either of two sets of two welding tips at opposite sides of the jig.

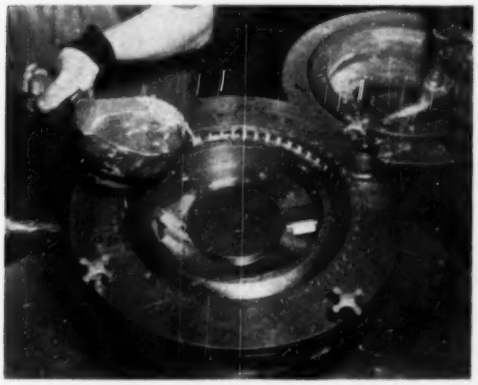
Once the blades are fixed permanently, the soft alloy is melted out in an electrically heated oil bath. The oil has a flashpoint well above the melting point of the alloy, so fire risk is unimportant.

The bath is equipped with a gravity seal which drains out solder until it drops to a predetermined level where gravity balance is attained. This keeps the oil in the tank, and prevents alloy overflow. Because the alloy is heavier than the oil, oil always remains on top; which prevents vaporization of alloy elements and allows its use over and over again.

Assemblies are dipped in mild alkali, then blown off with air. After an angularity check on the blades of all three units—rotor, turbine, and reactor cover—a final machining operation on a Bore-Matic cleans off all diameters and the parts are assembled with the output shaft and the cast-aluminum housing.

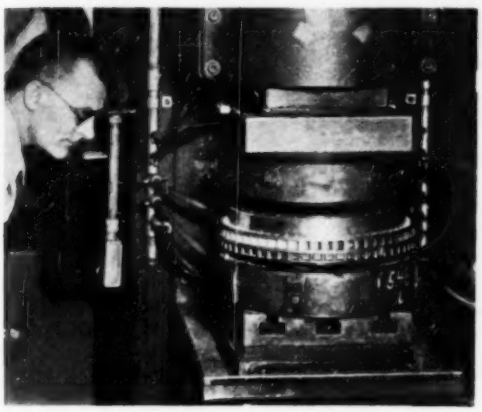
Rotor-pump blades have two rivet extensions on each edge, so assembly location between steel rotor and aluminum end plate is both quick and positive

Turbine-wheel blades are located in slotted fixture that is drilled for single rivet extensions. Housing-cover blades are located in similar setup

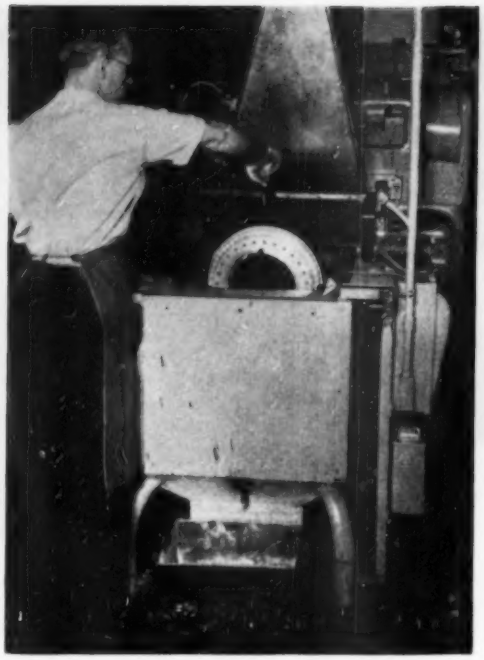


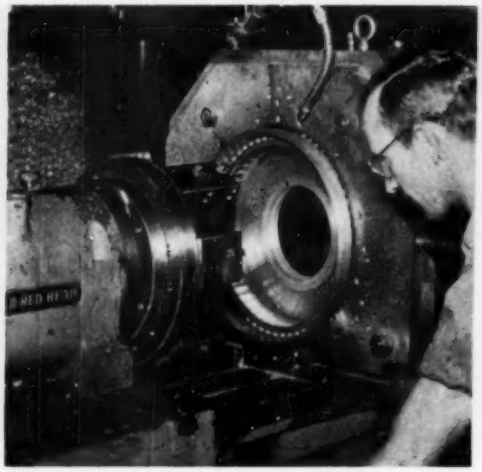
Wood's metal is poured into covered fixture to fix blades in position. Alloy is at 180 F when poured, cools quickly to form solid ring with rivet extensions exposed

End plates and center sections of two-stage wheels are located over rivet extensions to complete sub-assembly alignment before rivets are headed



Resistance welder heats extensions so 12-in. air cylinder above welding head can squeeze them. Rivet heads hold blades securely after alloy is removed



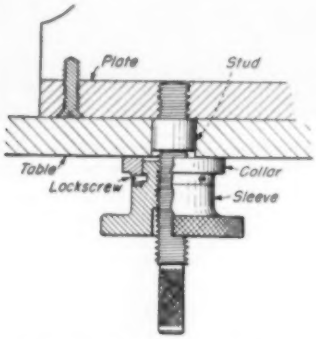


Final machining clears all diameters on pump, turbine, or reactor unit in one pass, insuring concentricity within 0.002 in.

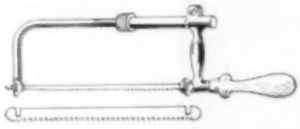
Strip heaters around insulated oil bath melt out Wood's metal at 375 F. Alloy flows below oil to tank bottom and is passed to drain by gravity seal until it drops to specified level

Short Cuts FOR THE SMALL SHOP

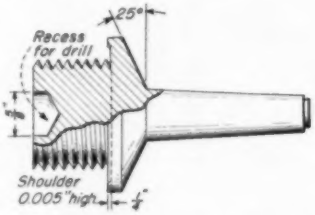
BY CHARLES L. LEEPER



VISE CLAMPS make it possible to locate a vise anywhere on a drill-press table, but it may be removed at any time. The device consists of a plate fastened to the vise base with flat-head screws and tapped for a stud. This stud has a collar that engages a table T-slot. After the vise is positioned, the sleeve and collar are screwed upward until the vise is solidly locked. The collar acts as a thrust washer and is secured to a groove in the sleeve by means of a lockscrew.



WIDER HACKSAW blades of the power type may be used in a heavy hand hasksaw frame to cut a better slot in thick material. More tension can be applied to the heavy blade than to the conventional thin blade. To adapt the blade to such usage, cut U-slots from the back of the blade so it can be slipped readily onto the wingscrews. This arrangement was found useful when a slitting saw mounted in a milling attachment on a lathe could not cut deep enough.



A TAILSTOCK ARBOR will hold a faceplate or chuck to grip pieces while drilling with the spindle. The device makes it possible to fit a faceplate with metal or wood pieces to serve as a fixture for duplicate pieces. Thus, advantages of production can be applied to a lathe.

ROUND TABLE

Little Plant Schoolhouse

"Have you finished your homework, Ed? Remember that it's due today—and no excuses or alibis."

"Lay off, will you, Al? It's bad enough to be expected to go back to school at my age, without taking a riding from you in the bargain. Just because the Old Man heard some guy talking 'postgraduate' training for foremen at a Manufacturers' Club lunch, we have to go to school— or else."

"That's the only way he'd get you there, and you know it, Ed. And the stuff we've had thus far is sound. I've used it lots of times already. It's like castor oil—good for you, but hard to take. The Big Boss is holding your nose, so to speak, just like your mother used to."

"I'm a big boy now, Al, and I don't like castor oil. And I don't like schooling—even with high-sounding names like organization, policies, cost factors, employee relations, quality control and a bunch of techniques for this or that. I've been doing all right, or I'd never have kept this job."

"Sure, you've been doing all right—but why not do better? The specialists teaching the course can give you pointers that help you do your job better. They teach you on company time; you ought to be willing to pitch in your own share of time for the homework. You're getting personal benefit out of it, you know."

"I've been told all that, Al, before. But I don't need some pipsqueak telling me his damp-behind-the-ears way of doing something I've been doing my own way for years without trouble."

"Without *much* trouble, you mean. All they're trying to do is make your job easier from here on out—give you more time to go fishing."

"Nuts—reading a book written by some guy who never saw this plant won't help my fishing time, now or later. Seems to me so many guys are trying to help me do my job that I spend more time than ever convincing 'em to save their crutches for somebody that needs 'em."

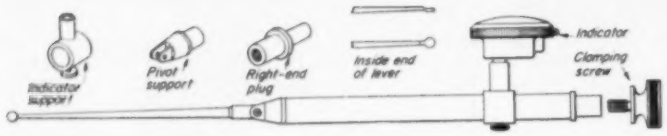
"They're not giving you crutches, Ed, although you're getting to an age where you'll need 'em. They're giving us all suggestions, then a chance to sit and talk 'em out with each other."

"I still prefer to talk with the guys I want to talk to, about what I want to talk about. This is a free country, ain't it? And I'm not so near being retired that some whippersnapper has to lead me around like a Seeing Eye dog! And that includes you! Everything we've talked about so far I've known and done for years."

"Then maybe you'll end up being the teacher, Ed—if you're a good boy and do your homework."

***WILL A "POSTGRADUATE" COURSE** in foremanship help an experienced foreman? Should the course be compulsory or optional? Are the results worth the cost—and the resentment? Your ideas on this subject will help others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Dial-Indicator Levered Extension Gets Into Long Bores

EXTERNAL DIAMETERS can be indicated directly on a dial indicator, but ID's cannot. This toolroom and machine-shop device, fitted with an indicator, will show deviations in both ID and OD, as well as indicate the normal run of dial-indicator work.

Basically the device is a lever, working at one end on the workpiece and at the other against the indicator. The drill-rod lever is drilled in the center and turned down along both shanks. The workpiece end is turned to a ball shape, and the dial-indicator end is turned to a ball, then cut flat. The top surface of the flat pad is exactly on the center of the lever.

A stainless-steel housing is cut from tubing, then fitted with two end plugs. One is yoked to support the lever on a pivot pin; the other is turned, drilled, and tapped to admit a knurled-head screw that allows clamping the device through a hole in a surface plate, if desired. Most conveniently, the housing can be gripped by a clamp on the lathe or other machine.

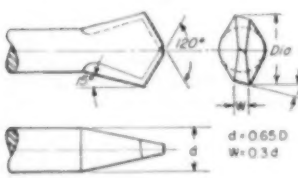
Support for the dial indicator is through a cold-rolled-steel fitting that is drilled for the shank of the indicator. The indicator spindle goes through a hole in the housing (drilled for that purpose) and contacts the flat end of the lever inside of the housing.

Total length of the indicating lever is 10 in., so the device can indicate work almost as deep as 10 in.—or can be made to a larger scale for larger work. *Armand V. Daoust, Lewiston, Me.*

Piano-Wire Drill Cuts Deep Holes

TO DRILL a hole with a diameter less than 0.040 in. and a depth of 20 or more times the diameter of the hole into steel, I have found the most practical method to be drills made from piano wire. The drills are cold forged, heat-treated, ground, and lapped.

Experience dictates that drill proportions should be those illustrated. For example, a hole that is $^3/_8$ in. deep with a 0.012-in. diameter is not too difficult to drill. But these special tools will cut such a hole with much less drift in the hole and less breaking of drills. Deeper holes can be drilled by grinding the point about 0.001 off center. *John Martin, Espinosa Pte. 1628, Monterrey, Mexico.*



ON OUR SMALL DRILLPRESSES — the ones with round columns—we have found a distinct advantage in having an additional table mounted on the column for a second setup. Quick changes from one table to the other can be made, and tooling can be set up on each for two different intermittent jobs. When one table is not in use, it can be swung around to the rear of the machine. Large jobs can be put on the lower table and a small vise can be bolted to the upper table. *Robert G. Planck, Nutley, N. J.*

Toolpost Steadyrest Braces Odd Lathe Jobs

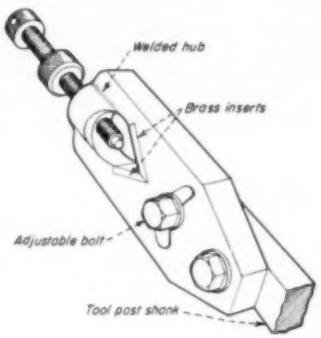
STEADYREST work can be handled by a tool clamped in a toolpost if it is not too heavy. This tool was machined out from a ½-in.-thick steel block that was drilled and tapped.

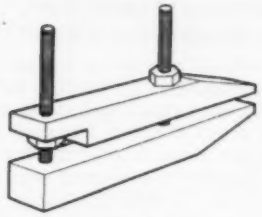
Two small blocks were welded to the main body of the tool to form a hub for the screw. These were then filed down to blend smoothly with the face of the body. The hole through the body was drilled and then formed so two brass inserts could be added. These were at 60° to each other so they and the screw would form equally spaced bearing points. They were pressed into machined slots in the body.

A knurled head on the screw, which was brass, made operation easy, and a mild-steel knurled locking nut was added so the screw could be wedged in position. This allowed holding the screw tight even though pressure on the work was slight.

At the other end of the body a hole and a slot were machined to take two bolts that fastened the body to a rectangular shank that fitted the lathe toolpost. The slot allowed vertical movement: horizontal movement was provided by loosening the toolpost screw.

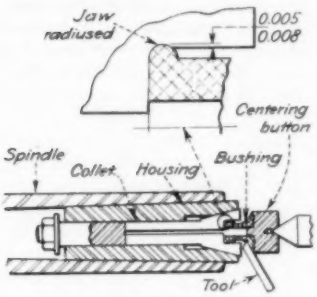
The final result was a tool that has been in constant use for five years. It simplifies recentering operations, braces work, and handles many odd jobs. *Thomas Gray, Belfast, N. Ireland.*





Clamps Are Free From Extension on One Side

TOOLMAKER'S CLAMPS, particularly in the larger sizes, made as illustrated, have advantages over conventional clamps. Adjustment is easier because the nuts are both on the same side of the clamp, and no projections are on the lower side, which allows setting the job on a work table. *R. H. Fry, Croydon, England.*



Custom-Built Collet Holds Bushings for Remachining

AN ENGINEERING CHANGE required that a number of finished parts had to be remachined to a new shape. The aluminum bushings had been formed with a round shoulder that made chucking almost impossible.

To hold the parts in a lathe, a special collet had to be made. This collet had a radiused groove in it that matched the shoulders on the parts. The machine employed was a bench lathe.

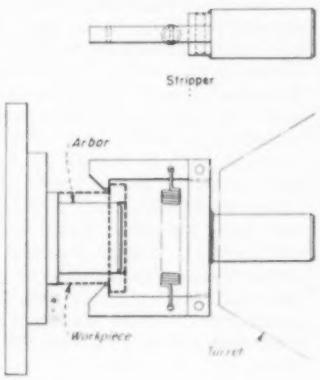
A collet housing, turned to an external taper to fit the lathe spindle, located the collet. At the back end of the collet a washer and nut were assembled to prevent it from coming out of the housing—but there was clearance between the housing and the washer so the collet could open and close.

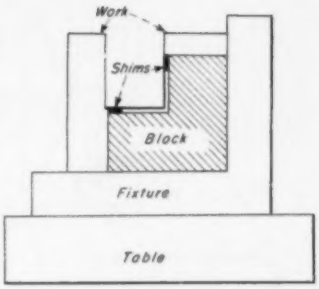
A ball-bearing live center was mounted in the tailstock to hold each part in the collet by pressing against a centering button that was formed to the shape of the bushing at the outer end. The button was a snug fit in each bushing, and was assembled before the part was chucked each time. With drive from the spindle and aligning pressure from the tailstock, it was easy to turn a 30° angle on the bushings. *C. F. Brown, Willow Grove, Pa.*

Arbor Stripper Works From Lathe Turret

ONE TURRET station of a turret lathe can be used to mount a special shop-made stripper that will remove work from an arbor in the lathe faceplate. This sort of stripper is often necessary when the work has to be fitted snugly onto the arbor.

The shank is machined from steel to fit the hole in the turret, and a rectangular upright is butt-welded to the shank to form part of the yoke. Two stripping jaws are pinned to the rectangular piece and are pulled together by a tension spring. The front ends of both jaws are machined off at an angle, so the jaws can be spread to grip a flange on the work by simply running the turret forward. *Roger Isetts, Kenosha, Wis.*





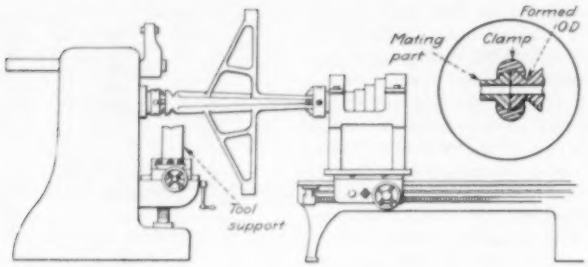
Indicator Block Locates Milling Table Under Cutter

MILLING-MACHINE FIXTURES for medium-production jobs are frequently employed in our shop. Unfortunately most of the graduated dials on the machines are quite undependable, so normally several trial cuts were necessary before dimensions could be established. This meant added setup and handling time until we hit upon the idea of using a hardened block set at a predetermined spot on the fixture, so that we could bring the cutter to the correct position without using the dials at all.

A block is machined and bolted to a given fixture at 0.010 below the surface to be milled and off to the side. A step in the block is located 0.010 back from a slot or side to be milled in the piece. With the workpiece in position, the table is raised and adjusted so the cutter just touches 0.010 feelers against the setting block.

As a result, we take the finish cut on the first piece, saving considerable time and trial and error. *Frank Biechele, Brooklyn, N. Y.*

SCREWDRIVERS can be dangerous when they slip out of a slot in a screw that is frozen tight or being driven down tight. One good way to handle such high-torque driving jobs is to set the work in the table of an arbor press, block it up or clamp it, and bring the driver down on the screw under the press ram. The driver can be turned with a small pipe wrench. *Yates R. Bands, Jackson, Miss.*



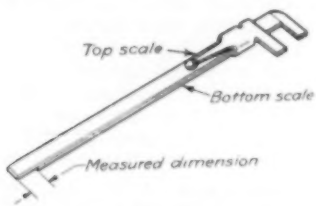
Double-Machine Lineup Forms Street-Light Fixture Shank

A LARGE CASTING in a small shop is something that usually makes trouble—bet we managed to machine some support members for street-light fixtures with an unusual set-up involving two machines at once.

The supports had a bore inside their vertical columns, and had two arms 4 ft long. We started with a milling machine, adapted to hold a small chuck that gripped the members internally, and added a short-bed lathe that was available. The lathe headstock—which had been jacked up to handle some other large cast parts—was reversed and mounted on a plate. The carriage was fitted to carry the plate so the head could be moved back and forth—so we could move the four-jaw chuck in the head to release the work.

Both machines were lined up so their spindles were in line, and the headstock setup was adjusted so it was the same height as the miller spindle. With a support member chucked in place, the arms cleared both machines and allowed us to turn the miller end of each member with tools in a raised block on the miller table. The OD's were cut with a form tool.

Formed OD's were turned on several hundred of the supports—to match similar forms on other parts of the lighting fixtures. Eventually the mating forms were held together with round clamps. *Laurence L. Hausman, Bayside, N. Y.*



Hull Inspection Simplified By Double-Scale Rig

INSPECTIONS of a Coast-Guard boat hull called for drilling the hull and measuring the thickness of the metal at a number of points. Only ¼-in. holes could be drilled, as they were to be plugged later, so measuring the hull was difficult.

We solved the problem by taking two small pocket scales—the kind commonly held by a pencil clip—and cutting one of the legs of the T-clip off on each one. Then we soldered the T-clips to the ends of both scales and rounded the corner on one so it could be turned into the holes. The T on the bottom scale was butted; the other was lapped to the end.

One scale was slipped into a sample hole and pulled tight against the inside edge of the hull, and then the other scale was slipped onto it (held by the flaps on the clip), lined up on top of it, and pushed toward the hull. A reading could then be taken at the outer ends of the scales. *W. A. Dice, Miami, Fla.*

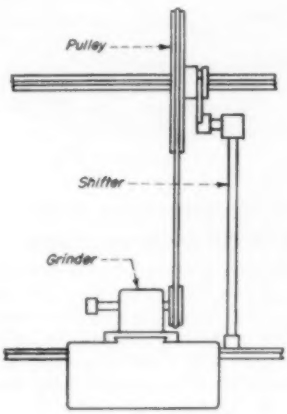
Ball Keys Grooved Hub To Grinder-Drive Pulley

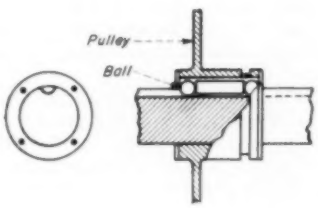
INTERNAL GRINDING on a lathe calls for clamping the grinder on the compound rest. Drive for the set-up shown was from a countershaft rigged on the back of the lathe.

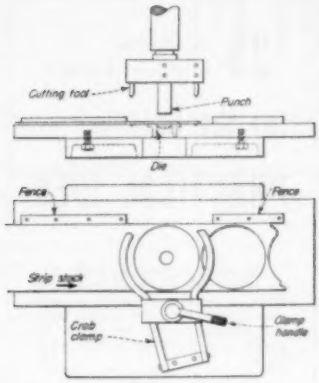
Instead of the usual key and keyway to drive the pulley and belt to the grinder attachment, the shaft in this case was grooved and the pulley hub retained a couple of balls in a semicircular groove in the hub. This allowed the shifter that moved the pulley along with the compound to operate with little friction.

The pulley rotated the grinder spindle in a bearing independent of the carriage feed. As the lead-screw moved the carriage, the shifter pushed the pulley along.

The assembly in the hub consisted of two end retainer plates on the hub, two bearing balls, and a rod that was smaller in diameter than the balls which kept them separated. *R. Mery, Farmingdale, L. I., N. Y.*







Trepanning Head Combined With Drillpress Punch

WE HAD to make large batches of light-alloy disks at regular intervals but not in sufficient numbers to justify tooling up a press permanently for the job. The setup we used was a combination punch and trepanning tool mounted in the spindle of a drillpress.

A trepanning head was mounted in the drill spindle, and a punch was inserted in a hole in the head; locked with setscrews. The spindle was lowered and the punch was mated to a die in a drill-table fixture. Two tools were carried in the trepanning head: one to cut out on the outer edge, and one to cut on the inner edge, so the tool would be self-clearing as it cut out the 3-in. disks.

Strip stock was fed along a fence on the jig and was held for each stroke by a crab-like clamp that cleared the toolbits. A short, sharp pull on the drill feed lever pierced the stock in the center, and then the quick-release spindle-drive clutch was engaged to rotate the head. The disks, which would be picked up by the tools as they broke through, were removed by rocking. Depth-stop location on the drill was important so the tools would pierce but not gouge the fixture.

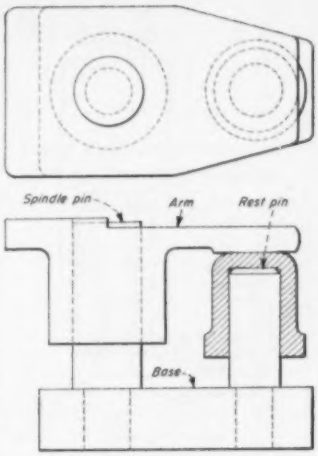
Further operations deburred the disks and finished the rounded edges and holes. *Dan Penway, Carlisle, England.*

Stepped-Arm Gage Can Be Operated by Blind Man

TWO VERTICAL PINS pressed in drilled holes in a baseplate form part of a gage that checks the thickness of bell-shaped parts, which are difficult to gage otherwise. In this case the wall thickness at the bottom of each part had to be measured.

The stepped arm is bored for a fairly tight slip fit on the spindle pin. The depth of the step is exactly the tolerance for the wall thickness. The height of the spindle pin in relation to the height of the rest pin is calculated by adding half the tolerance plus the thickness of the gaging arm at the rest pin to the rest-pin height.

Actual inspection can be done with a fingernail or with a sharp-pointed instrument. An advantage of the device is that a blind operator can use the gage without any trouble. If the level of the arm below the step is above the pin, or the level above the step is below the pin, the part is out of allowance. *H. G. Frommer, Milwaukee, Wis.*

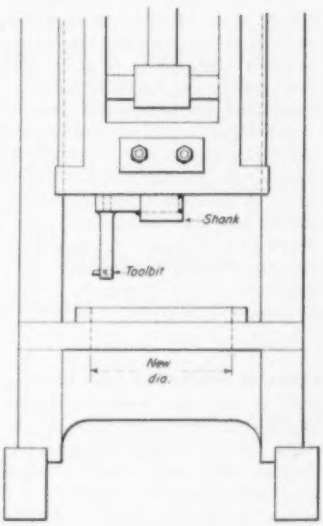


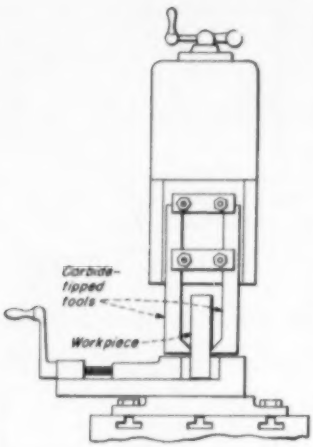
Press Ram Strokes Cutting Tool to Enlarge Bolster Hole

INSTALLING a hydraulic cushion on a punch press usually involves removing the bolster plate and bed so the plate can be cut out to a larger diameter. When we had to enlarge the bolster-plate hole on one of our presses, we decided that disassembly was too much work.

A special toolholder was made and attached to the press ram. This holder had a round shank that fitted in place of a die-shoe shank, and was made from welded stock so the bar extension of the holder was vertical. This fact nearly eliminated bending moment, so the tool was held rigid.

When the tool had been adjusted radially to the desired cut, the press ram was operated. After each stroke the toolholder shank had to be loosened and adjusted so the tool would take a cut at a new angle. After a complete revolution was made, the tool was advanced in the holder and the process was continued until the hole had been cut out ½ in. all around. Although the cutting cycle was slow for normal machining, we estimated that it took only a fraction of the time we would have spent if we had removed the bolster plate. *John J. Moffatt, Verdun, Canada.*





Two Matched Cutting Tools Cut Slab Skin on Shaper

PLAIN, FLAT STOCK that has to be machined on a shaper can be more easily and more accurately cut when a double-tool setup is made.

Two matching carbide-tipped toolbits are clamped in the clapper box so they cut exactly opposite each other—to balance the load. Work is clamped in a vise; and when one end is finished, it is reversed and finished upside down.

This idea is especially good when cast slabs have to be finished. A cut on one side normally releases stress as the skin is broken, which makes the slab twist and warp. When both sides are being cut at the same time, the stresses are equalized. *Kevin Chafe, St. Johns, Newfoundland.*

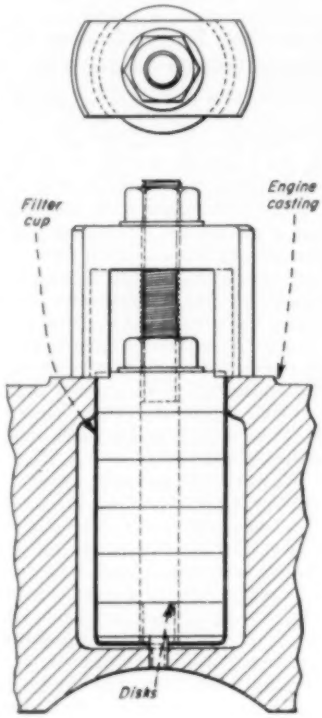
PARALLEL BLOCKS, instead of long parallel bars, are a good addition to any shop. First, they take up less room than a single long parallel. Second, they will support work that conventional parallels will not—like workpieces that have projections. Third, they are more economical than bars because they use less stock; and milling, hardening, and grinding operations to make them are cheaper. I now use a set of four blocks that are ¾x1x1¼ in. *Alvin H. Hammond, Trenton, N. J.*

Rubber Disks Squeezed To Exert Internal Pressure

FILTER CUPS are removed from engine blocks with rubber-disk internal clamps because no other clamps can be inserted or will hold the cups.

The cups are made from brass, and are pressed into holes bored in the blocks. To get them out without damaging them, a stack of rubber disks was cut and ground to the ID of the cups and was mounted on a long stud. A steel bottom disk was ground to an ID slip fit in the cups, so it would confine the rubber disks at the bottom of each cup. A similar top disk was added.

Tightening the pressure nut squeezes the rubber disks, which makes them bulge so they exert pressure against the sides of the cups until the cups can be easily lifted. *R. B. Wolverhampton, Staffordshire, England.*



$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

94th Winner

B. A. Lee

Combination

Boring Tool

NEWS OF METALWORKING

The Toledo Plan: UAW Tests Its Strength on Area-Wide Pensions

TOLEDO—The Plaskon Div. of Libbey-Owens-Ford Co. here has been selected by the regional UAW-CIO to test its strength over its demands for an area-wide pension plan which would provide (1) company-financed pensions of $100 monthly, including Social Security, and (2) a health security fund to which both company and employees would contribute.

Plaskon's three Toledo plants were struck by the 500 employees Jan. 31, one day prior to start of formal negotiations between the union and the company on a contract to replace the one expired June, 1949.

Back in October, announcement of the area-wide plan came as a bombshell to the 125 employers with UAW bargaining contracts in the Toledo area. The reaction: A hastily-formed "Committee to Save Toledo's Payrolls" sponsored full-page advertisements in Toledo's newspapers, in which copy claimed that Toledo had already lost considerable payroll through excessive union demands, and stressed the disadvantages present Toledo industry would face should such an area-wide plan be forced on employers.

UAW's retaliation: An announcement that it would strike any plant whose management did not accept the plan by Jan. 1, 1950. On Oct. 20 Devilbiss Co. was served with an ultimatum to either accept the area-wide plan within two weeks or have its plant struck. Devilbiss did not accept, nor has the plant been struck.

UAW Submits Details

It was not until Jan. 19, however, that UAW submitted the details for the area-wide plan: Each employer would pay 12 cents an hour per employee, 8 cents of that going into a pension fund. To the remaining 4 cents the employee would add about 2½ cents per hour, with the 6½ cents going to finance the welfare or health security program. The pension money would go into a trust fund under administration of a bank or trust company, with overall supervision held by an 11-man board, five representing the union, five from management, and the eleventh an impartial paid administrative head.

Under the program pensions would be paid to eligible workers under four different conditions:

1. Not less than $100 per month, including Social Security, for employee at or over 65 holding 25 years' credited service.

2. A monthly pension of $2.40 per month for each year of credited service to an employee at or after age 65 and having 10 to 25 years of credited service.

3. At or after 60 and after 25 years of credited service, a monthly pension equal to the actuarial equivalent of $60 at age of 65.

4. An employee on permanent or total disability after 25 years of credited service, a monthly benefit of $60.

Service Credit Transferable

Credited service, in all cases, would be based on the worker's employment with any of the companies participating in the plan after its inauguration. The employee's credit for a pension would follow him from one employer to another.

Plaskon negotiators are known to be ready to talk pensions for its employees on a company basis only. They have given no indication of being willing to even discuss the area-wide plan.

Expecting a long drawn-out struggle, the Toledo UAW is levying an assessment on working members of Local 12 for the benefit of strikers at Plaskon.

The Committee to Save Toledo's Payrolls declared, in a statement Feb. 2, that the plan is a "blind attempt to buy one form of security at the cost of the most important type of security we have—the jobs of our people."

Lower Rail Freight Rates Seen for Steel Mill Products

WASHINGTON — Lower rail freight rates on iron and steel shipments in the north and east are in the cards sometime this year. Over-all it is expected to match last fall's average 26% cut in the midwest. The railroads are putting their heads together now to work out the details. In the end it's going to effect a whopping big tonnage of iron and steel. Shapes and basic fabrications — all steel mill products—will be covered.

Reason: to meet competition from trucks, boats, and barges. The big headache is the increasingly large chunk of their business the t r u c k s have grabbed off since the Supreme Court outlawed delivered pricing. Then, too, there's the constant threat that consumers might buy their own trucks to transport raw materials and finished products.

Pensions Losing Luster With Many Who Favor "Bird in Hand" Idea

WASHINGTON—A pension from the boss many years from now is losing its luster in the eyes of many workers for at least two reasons:

1. Government old-age retirement payments under Social Security are being increased by Congress. The bill passed by the House would raise the average benefit 70%, making the average payment today $44 a month. Eventually, maximum payment to a family would be $150 a month.

2. There is no assurance that the workers will get a pension. Many things can happen. He may die, change jobs, or the company may go out of business. The result: no pension.

Since the wave of pension sentiment that followed the Steel Board's report, some employers have noticed a drift among workers away from pensions, although the union leaders continue to beat the pension drums. Instead, sentiment is shifting back toward benefits that can be realized immediately—"A bird in the hand is worth two in the bush."

There is more talk among the rank and file now of wage increases and sickness benefits. Some of it is beginning to show its influence on the union leadership.

Recall that President Walter P. Reuther of the CIO automobile workers offered, just before the strike, to settle with Chrysler for a 10-cent wage increase instead of a pension.

Industrial Shorts . . .

Nodular Cast Iron, a prospective forging material with high ductility, has reached the test-bar stage in recent standardization developments. Suggested dimensions for a keel block for property testing have been submitted to members of the Gray Iron Founders' Society. The material combines the high yield strength and elastic modulus of cast steel and the easy formability of gray iron. Common cast iron is formed into this ductile material by the addition of magnesium or a magnesium-containing additive in the furnace. GIFS approval of the proposed test keel has been sought to speed the establishment of standard engineering data on the metal. Members have been asked to make independent tests of the block.

The Air Force has placed a $3,600,000 order with AiResearch Mfg. Co., Los Angeles, for its new lightweight gas turbines to be used as ground heaters in Arctic operations. This is the first time that the recently developed self-contained gas turbines have been used in other than aircraft. The turbine is capable of producing 4 million Btu per hr on a −65° day.

Machine tools which can be operated at speeds more than 20 times faster than sound and with moving parts that can operate for years without wearing out are about to emerge from the laboratory, the Portland, Me., chapter of the American Society of Tool Engineers was told by W. W. Goehring, senior anti-friction bearing engineer of SKF Industries, Inc., Philadelphia. While spindle speeds of some grinding machines can now attain 100,000 rpm, he said, these speeds are being doubled in current tests in which very minute grinding wheels for ultra-precision metalworking and finishing are used in several small experimental grinding and polishing machines.

Productive Power, a traveling show to demonstrate how industry can do its work better, faster, and cheaper electrically, has gone on the road. Produced by Westinghouse Electric Corp., Pittsburgh, the show is sponsored by public utilities for their industrial customers in 125 cities. The show starts with a graphic demonstration of the effects of wire size and circuit protection in factory distribution systems. Lighting problems and how they affect production in the plant are discussed and demonstrated. Spot welding of two pieces of steel illustrates the ease and speed of modern resistance welders. The show opened in Akron, Ohio. Final demonstrations will be given on the Pacific Coast early in 1951.

Good Year for Farm Equipment Seen, Though Down from 1949 Level

CHICAGO—Shipments from plants of the American farm equipment industry during 1949 weren't far from the all-time record set by the industry during 1948. But demand for the major units of farm and industrial equipment made by the industry no longer exceeds its ability to produce. Users of such equipment generally have gone back to their prewar seasonal and selective buying habits. Sales during 1950 probably will vary with seasonal needs of the farmers, instead of remaining fairly level from month to month as during recent years. And any upward price adjustments made necessary by possible increases in cost of raw materials, higher wage rates, increased pension and welfare programs, etc., will mean added buyer resistance.

On the other hand, farmer-customers of the industry are in relatively good financial condition, even though some authorities expect 1950 farm income to be about 10% below the high level maintained during 1949. The progressive farmer has come to recognize the importance of expanded mechanization and the need for replacing obsolete equipment with the more efficient units developed in recent years, and major producers in the industry have done much to strengthen their sales organizations. So 1950 can be another high-level year for the industry. Certainly it will be a year of increased competition.

Raw Materials is Factor

Much will depend on continued availability of raw materials—the steel and coal strikes have caused major cutbacks in production schedules, and some plant shutdowns are imminent as this is written unless coal is made available promptly. Peace on the labor front also is of vital importance if production is to be maintained. International Harvester has estimated that production lost in its plants during 1949 as a result of wildcat strikes included 15,400 farm tractors, 2,000 crawler tractors, 400 power units, 400 harvester-threshers and 450 hay balers.

Production totals for the farm equipment industry for 1949, not yet available, are expected to approximate the all-time record set during 1948, when value of shipments of farm machines and equipment, including attachments and parts, totaled $1,684,589,689, an increase of about 30% over the $1,294,685,851 total reported for 1947. The domestic market took 88% of the 1948 shipments as compared with 87% for the preceding year. Value of shipments of tractors, attachments and parts for farm and non-farm use increased from $744 million in 1947 to $962 million in 1948. Shipments of completed tractors totaled 736,057 units (678,141 for farm use, 57,916 for non-farm use) in 1948, and 638,451 units in 1947.

Records of major makers of farm machinery for 1949 show the leveling off of both domestic and foreign sales being experienced by the industry:

	TOTAL SALES	
	1949	1948
Int'l Harvester	$988,910,000	$945,488,000
Deere & Co.	361,678,287	309,737,221
J. I. Case	170,273,938	154,220,504
Oliver Corp.	101,341,008	108,310,462
Minn.Moline	73,558,895	72,714,006
Caterpillar	254,871,526	218,037,541

While only a portion of its tractor production goes into the farm market, the 1949 sales record of Caterpillar Tractor is included above for comparison with other tractor makers. The increase of about 17% over 1948 sales was due chiefly to gains in the tractor and motor grader lines and was distributed rather generally to diversified markets all over the world. Export sales were 31% of total sales during 1949.

Domestic Sales Down

International Harvester's sales to customers in the U. S. accounted for 85.1% of total sales in 1949, compared with 86.9% in 1948. Of the 1949 total, domestic sales of farm implements, farm tractors, and service parts for these units accounted for $379,031,000, while sales of industrial equipment and service parts totaled $65,029,000. Comparable totals for 1948 were $333,995,000 and $77,881,000, respectively.

Show to Stress Business Side Of Metal Powder Industry

DETROIT—The Sixth Annual Metal Powder Show and Meeting will be held here April 25-26 at the Book-Cadillac Hotel, sponsored by the Metal Powder Assn., New York.

The technical program will stress business aspects of the industry rather than present the purely theoretical type of paper. Among subjects to be discussed are cost accounting in the industry, uses of metal powder in friction materials and in the radio and television industry, and a report of the outlook for powder metallurgy in various consuming industries. One entire morning will be given over to informal discussion.

Displays of the latest advances and developments in the industry will be shown by leading powder producers, fabricators and equipment manufacturers.

Meetings

Mar. 14-16—Society of Automotive Engineers, passenger car, body, and production meeting; Hotel Book-Cadillac, Detroit.

Mar. 28-31—Society of the Plastics Industry, national plastics exposition; Navy Pier, Chicago.

Apr. 10-12—American Society of Lubrication Engineers, annual convention; Hotel Statler, Detroit.

Apr. 10-14—American Society of Tool Engineers, industrial cost-cutting exposition; Philadelphia Convention Hall.

Apr. 12-14—American Society of Mechanical Engineers, spring meeting; Hotel Statler, Washington, D.C.

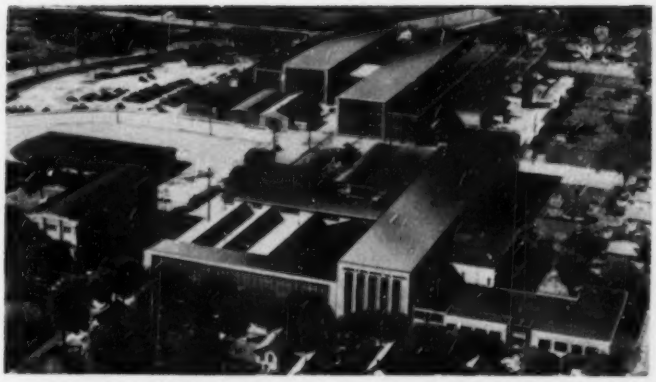
Apr. 17-19—Society of Automotive Engineers, aeronautic meeting and aircraft engineering display, Hotel Statler, New York.

Apr. 24—Packaging Machinery Manufacturers Institute, semiannual meeting; Hotel Sheraton, Chicago.

Apr. 24-27—American Management Association, national packaging exposition; Navy Pier, Chicago.

Apr. 25-26—Metal Powder Association, annual metal powder show; Book-Cadillac Hotel, Detroit.

Apr. 25-26—Machine Tool Electrification Forum, sponsored by Westinghouse Electric Corp.; Hotel Statler, Buffalo.



***CINCINNATI PLANER CO.** will move by July 1 into the modern Fond du Lac, Wisc., plant of its parent organization, Giddings & Lewis Machine Tool Co. The move to combine operations was decided to reduce general operating costs and to provide more extensive engineering and research facilities. R. J. Kraut, president and general manager, emphasized that Cincinnati Planer was not being liquidated and plans for moving the complete operation to Fond du Lac have been so set up as not to jeopardize sales and delivery of the Planer Co. products*

Here's the Program for ASTE's Cost-Cutting Tool Show

PHILADELPHIA — Technical sessions and plant tours scheduled for the Industrial Cost-Cutting Exposition to be sponsored here April 10-14 by the American Society of Tool Engineers have been announced as follows:

MONDAY, APRIL 10

1:00 pm Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 pm—DEVELOPMENTS IN PRESS-WORKING OF METALS (Convention Hall, Ballroom).
(a) "Forming Sheet Metal by the Marform Process—**Speaker,** R. B. Schulze, gen. supervisor of mfg. research, The Glenn L. Martin Co.
(b) "Carbide Die Developments"—**Speaker,** G. F. Eglinton, vice-pres., Lincoln Park Industries.
—COLD EXTRUSION OF METALS (Convention Hall, Room 200). **Speaker,** J. P. Bowden, Heintz Mfg. Co.

8:00 pm ECONOMICS FORUM (Philadelphia Academy of Music).

TUESDAY, APRIL 11

9:00 am—DESIGN AND USE OF DIECASTING DIES (Convention Hall, Room 200). **Speaker,** Chas. Franklin, master mechanic, Rochester Products Div., General Motors Corp.

9:00 am Plant Tours to Baldwin Locomotive; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

1:00 pm Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 pm—AUTOMATION OF GROUND AND TURNED PRODUCTION PARTS (Convention Hall, Room 200). **Speaker,** N. L. Bean, chief design engr., Automatic Transmission Program, Ford Motor Co.
—MACHINING AND FABRICATION OF HIGH-TEMPERATURE ALLOYS (Convention Hall, Ballroom). **Speaker,** C. L. Sandon, mfg. engr., Aircraft Gas Turbine Div., General Electric Co.

8:00 pm—MACHINABILITY (Benjamin Franklin Hotel Ballroom). **Speaker,** R. T. Hurley, pres., Curtiss-Wright Corp.
—TRENDS IN DRILLING (Bellevue-Stratford Hotel, Rose Room).
(a) "Application of Drill Units to Standard and Special Machinery"—**Speaker,** Eugene Numrich, application engr., Avey Drilling Machine Co.
(b) "Micro Drilling"—**Speaker,** J. A. Cupler II, general mgr., National Jet Co.

WEDNESDAY, APRIL 12

9:00 am—METAMICS (Convention Hall, Room 200). **Speaker,** W. O. Sweeny, Jr., asst. sales mgr., Haynes-Stellite Div., Union Carbide & Carbon Corp.

9:00 am Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

1:00 pm Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 pm—COLD ROLL FORMING OF METALS (Convention Hall, Room 200)—**Speaker** E. J. Vanderploeg, development engr. The Yoder Co.
—AUTOMATION (Convention Hall, Ballroom).
(a) "Automation in Forging and Heat Treating"—**Speaker,** from Oldsmobile Div., General Motors.
(b) "Automation in the Press Room"—**Speaker,** Herman Zorn, pres., V & O Press Co.

8:00 pm—TOOLING UP FOR MODERN TRUCK ENGINE PRODUCTION (Benjamin Franklin Hotel, Ballroom). **Speaker,** Joseph Olender, mechanical engr., International Harvester Co.
—USE OF ELEMENT TIME DATA FOR EFFECTIVE TOOL DESIGN (Hotel Bellevue-Stratford, Rose Room) **Speakers**—N. M. Perris and H. K. Keever, partners, Stevenson, Jordan & Harrison, Inc.

THURSDAY, APRIL 13

9:00 am—HARD SURFACING OF PRODUCTION TOOLS AND GAGES (Convention Hall, Ballroom).
(a) "Nitriding of High Speed Steel Tools and Gages"—**Speaker,** J. G. Morrison, chief metallurgist, Landis Machine Co.
(b) "Hard Chrome Plating"—**Speaker,** B. A. Taylor, vice pres., Chrome Electro-Forming Co.

9:00 am Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp. Camden, and SKF Industries, Inc.

1:00 pm Plant Tours to The Budd Co.; Philco Corp.; Westinghouse Electric Corp.; and Yale & Towne Mfg. Co.

2:00 pm—BROACHING APPLICATIONS FOR COST REDUCTION (Convention Hall, Ballroom). **Speaker,** O. W. Bonnafe, chief research engr., The La-Pointe Machine Tool Co.
—AUTOMATION IN HOPPER FEEDS FOR ASSEMBLIES (Convention Hall, Room 200). **Speaker,** C. E. Kraus, pres., Kraus Design, Inc.

7:00 pm—ANNUAL BANQUET (Bellevue-Stratford Hotel, Ballroom).

FRIDAY, APRIL 14

9:00 am—DESIGN ECONOMICS (Convention Hall, Ballroom), **Speaker,** John Van-Hamersveld, supervisor, Design Cost Control Group, Glenn L. Martin Co.

9:00 am Plant Tours to Baldwin Locomotive Works; Crown Can Co.; Link-Belt Co.; RCA Corp. (Camden), and SKF Industries, Inc.

2:00 pm—INVESTMENT CASTING (Convention Hall, Ballroom). **Speaker,** T. F. Frangos, sales engr., Haynes-Stellite Div., Union Carbide & Carbon Corp.
—EFFECT OF LATEST AMERICAN STANDARDS ON SPINDLE DEFLECTIONS (Convention Hall, Room 200). **Speaker,** Dr. Max Kronenberg, consulting engr.

McGraw-Hill

WORLD NEWS Notes

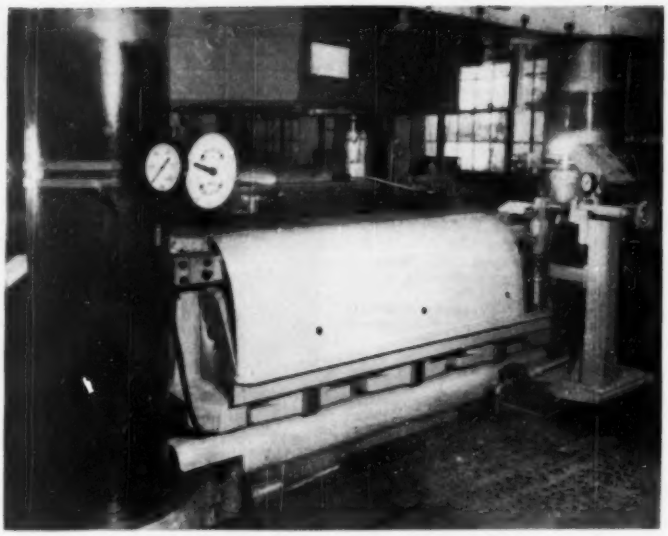
Australia's long-delayed large-scale earthmoving projects will soon be speeded up with £700,000 (about $1,575,000) worth of International Harvester Co.'s powerful DT-24 crawler tractors which will serve as prime movers for bulldozers, graders, scrapers and other construction equipment. Australia has just given IHC permission to ship the tractors without dollar license and to invest proceeds of the sale in expansion of the Australian branch plant. Capital of the subsidiary will be increased by £700,000 and shares in the equivalent amount will be issued to the American parent company. International Harvester has submitted a similar proposal to New Zealand.

Brazilian materials, largely, will be used by Studebaker in building cars and tractors in a plant near Sao Paulo, with output scheduled for 5000 units yearly. Certain parts, difficult to obtain here, will be imported from the United States. General Motors, Ford and International Harvester have assembly lines in Brazil, but most parts are imported.

Colombia's Paz del Rio steel mills will be financed by levying, for the next 20 years, a special tax of 5% on the income of every Colombian beyond 10,000 Pesos. Of this revenue, 50% will be invested in development of the steel mills; the other 50% will go to the Instituto de Credito Territorial. All savings banks must invest a minimum of 30% of the deposits and 15% of the reserves in bonds of the Banco Central Hipotecario, and another 10% in bonds of Paz del Rio.

Italy's Fiat Co. is not planning to set up a plant in Australia at the moment, rumors to the contrary. Fiat executives are on the way to Australia to explore the market for automobiles, tractors and machinery.

France will get the largest mechanical press in the world, a 750 metric ton giant by Clearing Machine Corp., Chicago. Clearing's French agent, Fenwick, is importing it for Arbel Co. of Douai. It will be utilized chiefly for making large steel stampings for use by the French National Railways. With a pressure of 3500 metric tons, the press can form a single sheet of metal 84 in. by 350 in. Due to the colossal weight of the press, it is being sent over in 28 pieces. Machining of the bed and other structure was done on the largest horizontal milling machine in the world, recently installed in the Clearing plant for its regular production operations.



***CONSTANT CONTROL OF HYDRAULIC PRESSURE** during the draw is the feature of Glenn L. Martin Co.'s Marform process, developed out of necessity by Martin engineers when formed parts came through with too many wrinkles under the usual processes. Martin has now accepted a proposal of Hydropress, Inc., New York, to manufacture and sell the Marform metal-forming units. Precision control of the pressure enables a part to be formed free of wrinkles and reduces springback to a minimum. The operator can make complete sheet metal parts involving drawing, shrinking and stretching at the rate of 50 to 120 per hour. The above view is of a Marform machine from the front, showing the form tool, cam-actuated pressure control, pressure indicator and depth of stroke gage*

Outlook Encouraging for Tool & Diemakers; Few Orders Placed for Rearmament Tooling

WASHINGTON — Encouraging reports of business outlook were given by trustees of the National Tool & Die Manufacturers Assn. from widely scattered areas, at the group's meeting here Feb. 9. Others emphasized that orders were still scarce, and that shipments were running much the same as in late 1949, when they were about 85% of the year previous. Television is still producing good business for eastern tool and die shops interested in that field, and new automobile transmissions and engines are helping the outlook in the Detroit area especially.

Disappointing is the small volume of orders placed for tooling or development work for the rearmament program. Aircraft companies and other firms with large prime contracts apparently are producing most of the special tooling required, in their own tool rooms, but there is some reason to believe more will be let out as these programs become further advanced.

Equally disappointing is the very low prices at which government contracts for small metal products or parts are being awarded. Presumably as a result of a misunderstanding of specifications or errors in bidding, often such contracts are let for little more than the normal cost of the materials required, it was stated.

Most tool and die shops are down to a 40-hour week, but in several of the smaller cities they are still working five nine-hour days. In Detroit, a 32-hour week has not been uncommon.

Centre W. Holmberg, NTDMA president, outlined some of the tax problems that are causing tool and die manufacturers difficulty: The notch provision on income between $25,000 and $50,000; the threat of Section 102; double taxation of corporation dividends; and too low depreciation allowances. Government speakers outlined how various agencies in Washington are working to remedy these recognized inequities.

General Stewart E. Reimel and Captain E. R. Henning, of the Production Office, National Security Resources Board, discussed with the trustees how the tool and die industry could best fit into the overall industrial mobilization plans.

Higher Duties On Aluminum Asked

WASHINGTON — Reynolds Metals Co., Inc., is spear-heading a move by the U.S. aluminum industry to get the Administration to invoke the Reciprocal Trade Act's escape clause and raise import duties on both crude and wrought aluminum.

During the Geneva tariff cutting negotiations, the U.S. accepted import duty cuts on both these products—crude aluminum duty was reduced from 3 cents lb to 2 cents lb; wrought aluminum, sheets, plates, bars, coils, etc., had duties cut in half, from 6 cents lb to 3 cents lb. Under the Reciprocal Trade Act the President is allowed to negotiate tariff cuts up to 50% of the 1945 "base level."

Imports Have Skyrocketed

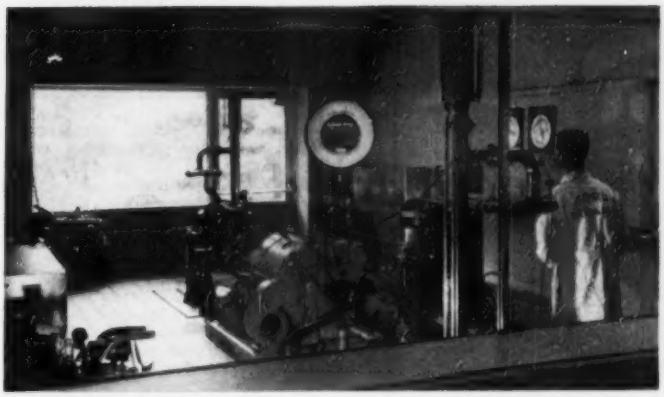
Since Geneva, U.S. imports of both crude and wrought aluminum have skyrocketed. Administration trade experts claim it is due to increased production abroad concurrent with industrial recovery under the Marshall Plan. Reynolds will point out that most crude imports come from Canada (Alcan, the Aluminum Company of Canada), and that anyhow, they are being hurt by the competition.

Under the so-called escape clause the President is authorized to raise tariffs not only back to the 1945 base level but up another 50% as well to protect any U.S. industry being unduly hurt by foreign competition.

Reynolds is asking for the limit. It wants duties on crude aluminum jumped from the present 2 cents lb to 4.5 cents lb; on wrought products raised from 3 cents lb to 9 cents. Kaiser Chemical and Aluminum Corp. (Permanente) will back up Reynolds' brief with one of its own. Aluminum Co. is expected to follow suit by co-signing another brief to be filed by the aluminum association.

Alcan Mill Feared

One thing that both Reynolds and Kaiser fear is that Alcan will build an aluminum rolling mill to match its mammoth crude production plant, unless duties are raised on wrought aluminum. Alcan's crude production capacity substantially matches total U.S. production. Alcoa is put in a peculiar spot on this particular point. Eleven stockholders own controlling interest in both Alcoa and Aluminum Ltd., the holding company which controls Alcan and most of the rolling mills in England. Reynolds will play this inter-relationship up heavily in its case before the tariff commission.



***FORD V-8 ENGINE** is being tested here in Ford Motor Co.'s new engine development laboratory in Dearborn, Mich. The engine in the foreground is being tested with the 200 hp direct current amplidyne dynamometer acting as a brake to determine the horsepower of the engine on a performance run. At the left end of the dynamometer is a Ford 6-cylinder engine which has been readied for testing when the V-8's run is finished. Each engine is supported by four universal mounting jacks developed by Ford engineers. This view from the corridor, shows the double panes of plate glass which help make the 15 test rooms sound-proof. At the upper left is a traveling crane for lifting and moving test engines into place anywhere in the room*

Steel in 12 Minutes from 'Turbo-Hearth'

NEW YORK—Working details of a new fast steelmaking process were presented by its inventor and his collaborator here Feb. 16 before the annual meeting of the American Institute of Mining and Metallurgical Engineers. Called the "Turbo-Hearth" and sponsored by Carnegie-Illinois Steel Corporation, it was said to be capable of making open hearth-quality steel in 12 minutes without using external fuel.

The men who described it and are largely responsible for its present development are C. E. Sims, assistant director of Battelle Memorial Institute, Columbus, Ohio, and F. L. Toy, assistant to the manager, research and development division of Carnegie-Illinois, largest subsidiary of United States Steel Corp.

Like the product of the Bessemer converter "Turbo-Hearth" steel is made without external fuel, the heat being provided from chemical reaction by burning the impurities in liquid iron with a blast of air. In the "Turbo-Hearth" the air is applied from the side, at the surface of the hot metal charge.

In the course of their work, the researchers first made thirty-two 1000-pound heats of steel in a laboratory experiment at the Battelle Institute. The results of these small test heats were verified by making fifteen commercial-scale heats.

The steel produced was cast into ingots, rolled into plates, and subjected to exhaustive tests to ascertain such vital mechanical properties as tensile strength, bending, strain aging and impact. In every respect, Mr. Sims and Mr. Toy asserted, "Turbo-Hearth" steel behaved like open hearth steel of similar composition.

The "Turbo-Hearth" development is regarded as especially important because it provides a steelmaking method that is fast yet flexible. A hearth of 30-ton capacity is capable of making much more steel in a day than a 225-ton standard open hearth furnace. Many or few hearths may be used, as demand for steel production warrants. Most significant is the fact that oxygen may be added to the standard air blast still further to speed steelmaking.

Impact Extrusion Is PMI Symposium Topic

CLEVELAND—The first general discussion of cold extrusion of steel is scheduled for the second day of the two-day symposium sponsored by the Pressed Metal Institute here March 16-17. Representatives of the Munitions Board, Ordnance, and civilian organizations will join in presenting aspects of this advance in metal forming. Prejudging and testing of metals will be considered March 16. A display of equipment will be held in conjunction with this session.

Detroit

POWER STEERING PROBED ... FORD WORKING ON ADVANCED ENGINES
TOOLING OUTLAY FOR GM TRANSMISSIONS . . . MARCH OUTPUT SAG

For some time now there has been veiled conversation about the possibility of a new area of automobile development that would have notable tooling aspects—the use of power mechanisms for steering. At a recent Detroit meeting of the Society of Automotive Engineers, however, indications were fairly definite that the project is hardly in an active stage anywhere.

Engineers from General Motors and Ford exhaustively developed all aspects of steering engineering, including power steering. Their concensus: power steering is not a production program for the foreseeable future because (1) there is no great demand for it from customers; (2) present automobile designs lack space for power installations; and (3) noise is a considerable problem.

All the same, these protestations do not take into account a growing complaint among car owners—particularly as tires become fatter and steering more difficult—that automobile handling is becoming a job for musclemen, especially to get in and out of curb parking places. Women particularly are protesting.

It is a fact, regardless of the positions put forward at the SAE meeting, that petroleum companies have been studying the problem alongside the auto engineers, and feel much more strongly than do the car people indicated that there's something definite in the wind.

New Engine Programs

Nearer to hand—insofar as tooling outlooks are concerned—is the possibility of new engine programs at Ford Motor Co. Ford is working tooth and nail on advanced powerplants—a tour through their new dynamometer building in the engineering center disclosed recently that nine out of 15 engine test rooms were draped with black cloth, hiding what was going on inside.

Best guesses are that (in addition to radical types of engines) these test rooms are going through final testing on a brand new V-8 and a new 6-cylinder engine for 1951 models. Stiffer than in the past, they will take higher compression ratios and be capable of still further ratio stepup as gasoline improves. Releases on the tooling for these powerplants can be expected shortly; some work may actually have already begun inside the Rouge toolrooms.

These new engines will ultimately be manufactured in a new Rouge engine plant, the former parts and accessories building. This building housed aircraft engine manufacture during the war; its revamping will begin next October, with the timetable calling for a start on production a year thereafter.

At this time, October, 1951, motor building will be discontinued in the present plant, which has become overcrowded and obsolete. Employes will be transferred. Machining operations in the casting machine plant will also be moved into the new motor plant.

Simultaneously, Ford plans to modernize its production foundry at the Rouge; it will be expanded into the area vacated by the casting machine plant. In addition, the steel foundry will be completely re-equipped and converted to production of crankshafts and exhaust valves for the new motor plants.

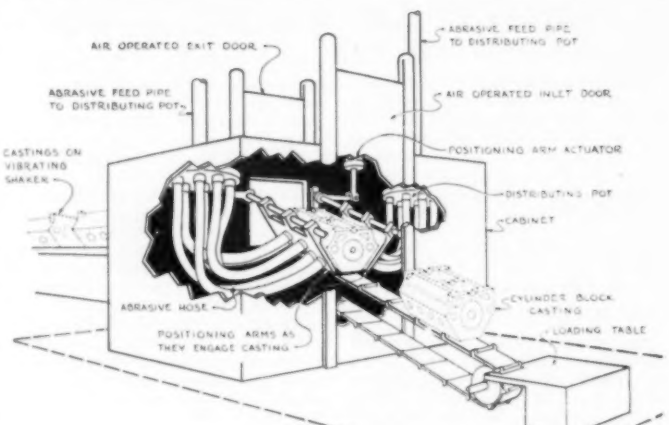
The parts and accessories building is one of the most modern in the entire Rouge layout, having been built during the war as a government facility. The company bought it from the WAA late in 1947.

Expansion is certainly the keynote of Ford activity these days. Nearby the new dynamometer building remarked on above will shortly be joined by another wing of equal size (the first wing houses 16 cells, one for transmission testing) and after that a center section for offices and engine engineering administration.

Cost of Transmission Tooling

How much expense to tool for a new automatic transmission? Ward's Reports, Inc., says that Ford and Warner Gear, preparing for production of the new Ford automatic mechanism due to appear this summer, have each spent about $2.5 million for tools, another $6.5 million for plant equipment. Another $8 million or so is estimated as the expenditure for Borg-Warner transmission for Studebaker.

Perhaps the largest individual outlay of all lies directly ahead, by General Motors. That company's Detroit Transmission Div. is preparing to start construction of its new plant near Plymouth, which will take over much of the load now being borne by the main plant inside Detroit. The Transmission Div. is now operating at a rate close to 10,000 units daily for Olds, Cadillac, and Pontiac requirements; this does not include the volume of torque converter types for Buick and for Chevrolet.



***NEW INTERNAL SHOT BLAST CLEANING MACHINE** is used at Ford's Rouge Div. to eliminate engine trouble developing from inadequate block cleaning. Blocks are conveyed to the sand blast cabinets. Two work-positioning arms, one for each side of the casting, register blocks in correct position for applying blast of shot through 16 "Norbide" nozzles at 85 psi air pressure. Water jacket interior surfaces are cleaned bright by the iron or steel shot and grit used. The air blast equipment operates automatically to pick up cylinder blocks, align nozzles, and shut off when cycle is complete*

Names in the News

Harry E. Masters

Harry E. Masters has been named educational director, L. S. Starrett Co., Athol, Mass., and **C. G. Nordmark** has been named advertising manager. Mr. Masters will be in charge of all vocational education and industrial apprentice training programs and activities, as well as all trade shows and conventions. Mr. Nordmark previously served as advertising manager of Lord Mfg. Co., Erie, Pa., and assistant publicity director of Heald Machine Co., Worcester, Mass.

Stephen M. Jenks has been elected vice president in charge of operations, Carnegie-Illinois Steel Corp., Pittsburgh. He succeeds **James E. Lose**, recently elected executive vice president of the U.S. Steel subsidiary. **William C. Oberg** has been named general manager of operations.

Fred M. Shelley, Jr. and **Alfred G. Dennison** have been named general sales manager and assistant general sales manager, respectively, of Riverside Metal Co., Riverside, N. J.

Arthur J. Renz

Arthur J. Renz has been named field engineer on precision spindle applications, Pope Machinery Corp., Haverhill, Mass.

M. R. Minnick, formerly manager of sales of American Welding & Mfg. Co., Warren, Ohio, has been named general manager of sales. **H. D. Malone** has been made manager of sales of a newly created Industrial Products Div. **D. W. Dawson** has been named manager of the Product Development Div.

O. D. H. Bentley has become associated with Whiten Machine Co., New London, Conn., as consultant engineer on steam turbines. **Eugene B. Williams** has joined Whiton to take charge of sale of steam turbines for U. S. Navy applications. Mr. Bentley was chief engineer of B. F. Sturtevant Co., Boston. Mr. Williams was vice president in charge of sales for Sturtevant.

Robert F. Dick

Robert F. Dick has been named administrative assistant to **Calmer L. Johnson**, vice president and treasurer of Illinois Tool Works, Chicago. Mr. Dick was for ten years vice president of George Fry & Associates, Chicago and New York.

A. M. Boehm has been named eastern manager, Engine Div., Worthington Pump & Machinery Corp., with headquarters in the New York office. He succeeds **W. L. Russell** who has been assigned to handle Canadian sales for John Inglis Co., Worthington's Canadian associate.

Ernest M. Knapp has been elected treasurer and assistant secretary of Ferro Machine & Foundry, Inc., Cleveland, replacing **N. E. Gauthier** retired.

Edward N. Cole has been promoted from chief engineer to works manager of Cadillac Motor Div., General Motors Corp., Detroit, succeeding **C. A. Raftrey** who died Dec. 20. **Charles F. Arnold** succeeds Mr. Cole as chief engineer.

H. B. Spackman

H. B. Spackman has been elected president, Lyon Metal Products, Inc., Aurora, Ill., succeeding Earl D. Power, newly elected chairman. Mr. Spackman joined Lyon in 1937 as general sales manager, coming from U. S. Gypsum Co. where he had started the Steel Products Div. Previously he was assistant general sales manager of Northwest Expanded Metal Co. Mr. Spackman was elected a director and vice president in charge of sales at Lyon in 1939, and in 1946 was made executive vice president in charge of sales. As president, he will be vice chairman of the executive committee.

Donald D. Stone has been named automotive power plant engineer at Willys-Overland Motors, Inc., Toledo. He joined Willys-Overland in 1939 as a research engineer, was later named director of research, and in 1947 was assigned duties of equipment engineer. Previously he was affiliated with Buick Div., General Motors Corp.

Arthur Schwarz has been named vice president in charge of sales, Nooter Corp., St. Louis.

H. C. Weidner, Jr.

H. C. Weidner, Jr., has been named general supt. of manufacturing operations, Townsend Co., New Brighton, Pa. He succeeds **Harry Goodwin** who will continue in an advisory capacity and as director of research and development.

Major Aaron E. Carpenter

William F. MacDonald

William F. MacDonald was elected president, E. F. Houghton & Co., Philadelphia, succeeding **Major Aaron E. Carpenter,** who voluntarily relinquished the presidency and was elected chairman of the board. Maj. Carpenter remains the chief executive officer of the company. Mr. MacDonald continues to hold his present office as treasurer also.

J. M. Spangler has been named president, National Carbon Div., Union Carbide & Carbon Corp., New York.

Latest Air Force Bid Awards Announced

DAYTON, Ohio—Latest Air Force bid awards are now being made available to AMERICAN MACHINIST by Air Materiel Command, Wright-Patterson Air Force Base. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, Attention: MCPAXC.

A partial listing of procurement abstracts of interest to Metalworking follows:

Stand Assembly (50-415): Aeronca Aircraft Corp., Middletown, Ohio, on a bid of $136,772.00.

Cut Out, Reverse Current, Spares, etc. (50-422): Hartman Electrical Mfg. Co., Mansfield, Ohio, on a bid of $49,899.42.

Battery (50-432): National Battery Co., Gould Industrial Div., Depew, N. Y., $80,767.68.

Plug, engine cylinder dehydrator (50-459): Clark Metal Products, Inc., Fairfield, Conn., $30,954.90.

Can: reel (50-492): Compco Corp., Chicago, $143,055.

126 shelters (50-401): Portabilt Structures, Inc. Housing Div., Janesville, Wisc., $173,976.12.

Indicators (50-527): Lewis Engneering Co., Naugatuck, Conn., $40,729.21.

Indicators (50-541): General Electric Co., Schenectady, N. Y., $41,294.53.

Camera and supplies (50-381): Bell & Howell Co., Chicago, Ill., $74,404.46.

Aluminum tubing (50-390): Companies sharing: Reynolds Metal Co., Louisville, Ky., on a bid of $34,464.29; Du Betta Metals Corp., Long Island City, N. Y., $11,526.23, and Aluminum Buying Co., Long Island City, N. Y., $7,916.73.

Starter assemblies and data (50-394): Jack & Heintz Precision Industries, Inc., Cleveland, $21,664.20.

Stand assemblies (50-470): Airquipment Co., Lockheed Aircraft Corp., Burbank, Calif., $39,237.

Electric indicators (50-547): Kollsman Instrument Div. of Square D Co., Elmhurst, L. I., N. Y., $84,165.

Multimeters (50-326): Phaostron Co., South Pasadena, Calif., $185,998.02.

11 field maintenance shelters (50-433): Toll & Henson Co., Detroit, Mich., $49,995.

Hydraulic jacks (50-449): Jumbo Steel Products, Azusa, Calif., $27,561.60.

Fuel pressure indicators (50-524): Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., $107,231.71.

Indicators (50-567): General Electric Co., Schenectady, N. Y., $53,446.57.

418 roller chain assemblies (50-578): Baldwin-Duckworth, Chain Belt Co., Springfield, Mass., $17,163.08.

15,000 ball bearings (50-585): Barden Corp., Danbury, Conn., $11,850.

Rivets (50-588): Companies sharing: Dumont Aviation & Supply Co., Long Beach, Calif., $1,329.35; Air Associates, Inc., Teterboro, N. J., $1,280, and Reed and Prince Mfg. Co., Worcester, Mass., $240.

Regulator assembly (50-559): Linde Air Products Co., New York, $23,000.

Screws (50-507): Companies sharing: Air Associates, Inc., Teterboro, N. J., $370.02; Anchor Rubber Co., Dayton, $786.44; Manhattan Lighting Equipment Co., Inc., New York, $2,119.80; Globe Bolt & Screw Co., New York, $913.33, and Set Screw & Mfg. Co., Bartlett, Ill., $1,060.15.

Washer head screws (50-460): Companies sharing: M. D. Parts Mfg. Co., Div. of Napco, Inc., Los Angeles, $1,486.44, and Aerocrafts, Halle Flying Service, Austin, Texas, $317.20.

9,600 ball bearings (50-517): New Departure Div. of the General Motors Corp., Bristol, Conn., $5,232.

Indicators (50-522): Kollsman Instrument Div. of Square D. Co., Elmhurst, Long Island, N. Y., $144,081.82.

Transmitters (50-607): Liquidometer Corp., Long Island City, N. Y., $19,548.39.

Spare parts for C-6 (50-595): Taylor Machine Co., Cleveland, O., $9,663.35.

Screws (50-587): Companies sharing: Reed & Prince Mfg. Co., Worcester, Mass., $551.20; National Screw & Mfg. Co., Cleveland, $374.35; Anti-Corrosive Metal Products Co., Castleton-on-Hudson, N. Y., $185.77; Frank W. Smith Co., Inc., Gardner, Mass., $590; Waltham Screw Co., Waltham, Mass., $634.60; Ohlson-Empire Div., Ohlson Internation Corp., Long Island City, N. Y., $788.80, and Air Associates, Inc., Teterboro, N. J., $437.20.

Radar receiver, tuning unit (50-295): Specialty Assembly & Packing Co., Inc., Brooklyn, N. Y., $316,884.20.

Trainer assembly (50-519): Companies sharing: Design Fabricators, Inc., Dayton, $1,886.25; Management & Research, Inc., Primos, Pa., $7,600; Ideal Laboratory Tool & Supply Co., Cheyenne, Wyo., $10,755; G. Felsenthal & Sons, Inc., Chicago, Ill., $327, and American Automatic Typewriter Co., Chicago, $2,300.

Test stands (50-655): United Mfg. Co., Advertising Corp., New Haven, Conn., $22,085.

2,740,000 feet tow target cables (50-656): Hackensack Cable Corp., Hackensack, N. J., $112,340.

11,000 ball bearings (50-636): McGill Mfg. Co., Inc., Valparaiso, Ind., $15,290.

Signal generators (50-523): Cole Instrument Co., Los Angeles, Calif., $130,575.

Transmitters (50-665): Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., $106,711.22.

Machine Tool Awards

Lathe, etc. (50-434): Companies sharing: Reed Prentice Corp., Worcester, Mass., on a bid of $6,303.05 and Bardons & Oliver, Inc., Cleveland, $6,737.73.

2 boring machines (50-435): Ex-Cell-O Corp., Detroit, $33,000.

2 grinders (50-473): Waterbury Tool Div., Vickers, Inc., Waterbury, Conn., $3,577.40.

1 grinder (50-474): C. H. Gosiger Machinery Co., Dayton, $5,608.

8 band saws (50-482): Companies sharing: Boice-Crane Co., Toledo, $3,863.20, and C. H. Gosiger Machinery Co., Dayton, $2823.39.

7 milling machines (50-526): Companies sharing: N. Ransohoff Inc., Cincinnati, $4,075, and E. A. Kinsey Co., Cincinnati, $12,546.

OBITUARIES

William Philip Sieg, founder and former president of Titan Metal Mfg. Co., Belleponte, Pa., died Jan. 27.

G. Earl Jones, 68, died Feb. 12. He represented Lovejoy Tool Co., Inc., Springfield, Vt., for 22 years in Michigan. For the past two years he had covered only western Michigan and the Toledo, Ohio, area.

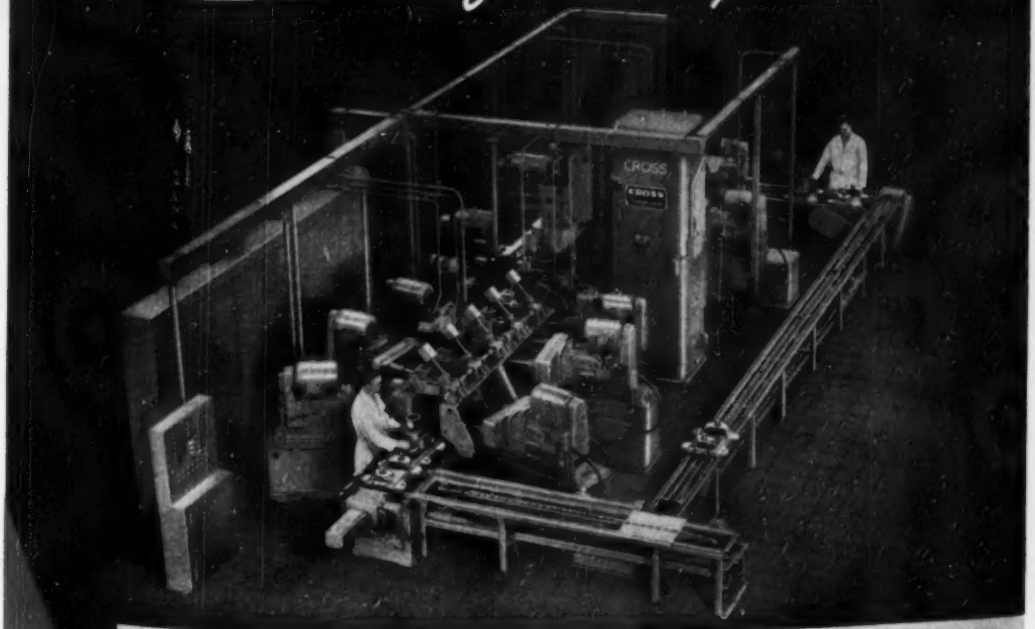
Max McMurray, 74, long identified with the iron and steel industry, died in Cleveland Jan. 29. He was most widely known for his work in building the Magnitogorsk Steel Works in Russia in the 1930's, when he was chief field engineer for the firm which held the construction contract, Arthur G. McKee Co.

J. Robert Cartwright, co-owner of Lambert Co., Ltd., Los Angeles distributor and manufacturer of automotive parts, died Feb. 8.

Frank O. Lincoln, 75, chairman of Hy-Pro Tool Co., New Bedford, Mass., died Feb. 11. Early in his career Mr. Lincoln was with Taunton Tack Works and Atlas Tack Co. For 45 years he was a sales executive for Morse Twist Drill & Machine Co., later becoming vice president in charge of sales.

Frank A. Hughes, 49, manager of sales engineering dept., Bay State Abrasive Products Co., Westboro, Mass., died Feb. 12. He was a member of Bay State's junior executive committee, and a member of ASTE.

Another Transfer-matic by Cross



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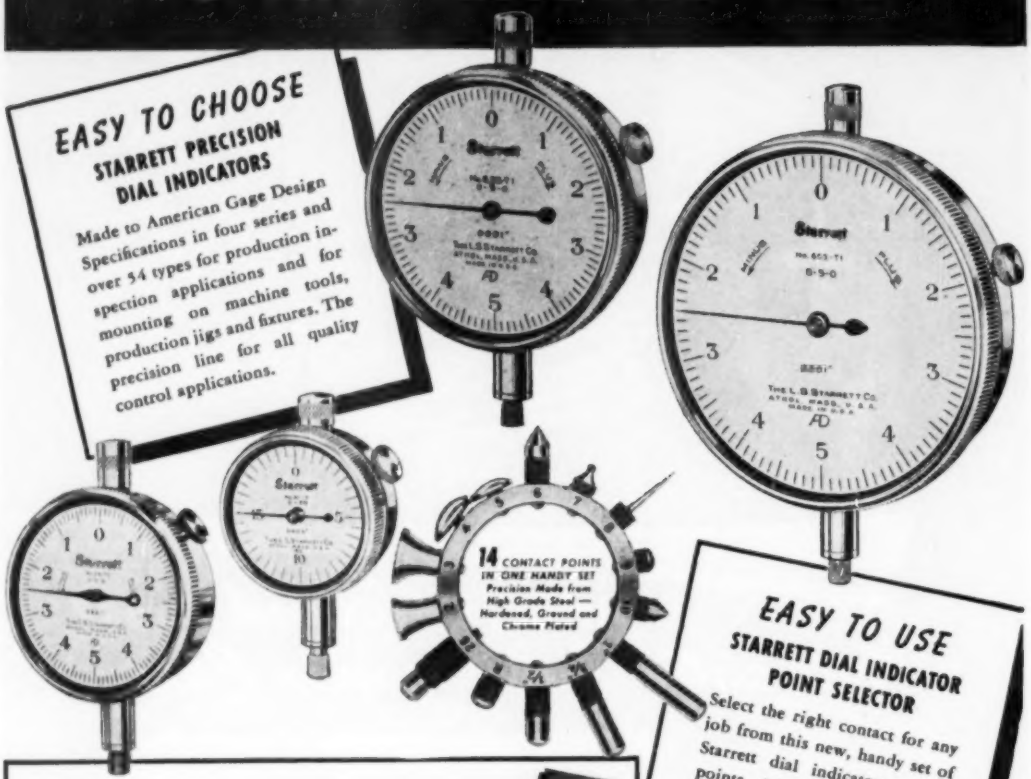

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Estimating Centerless-Grinding Time

BY V. G. HOTCHKISS, Industrial Engineer,
DEERE & CO., MOLINE, ILL.

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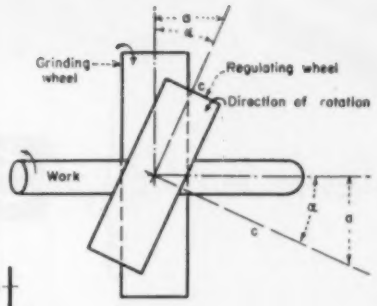
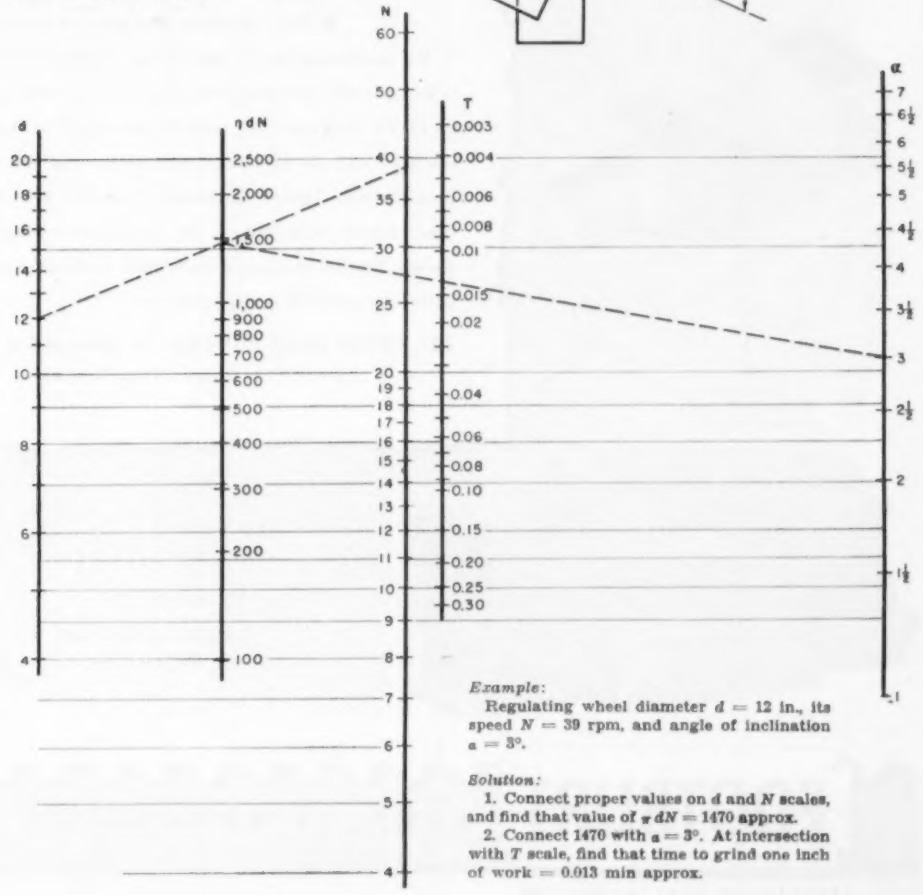
A regulating wheel imparts velocity to the work according to the formula $a = c \sin \alpha$, where a = work velocity, c = velocity of regulating wheel, α = angle of inclination of regulating wheel. Longitudinal work feed in ipm, $F = \pi\, dN \sin \alpha$, where d = regulating wheel dia, in., and N regulating wheel speed, rpm. Time to grind one lineal inch of work, $T = 1/F$.



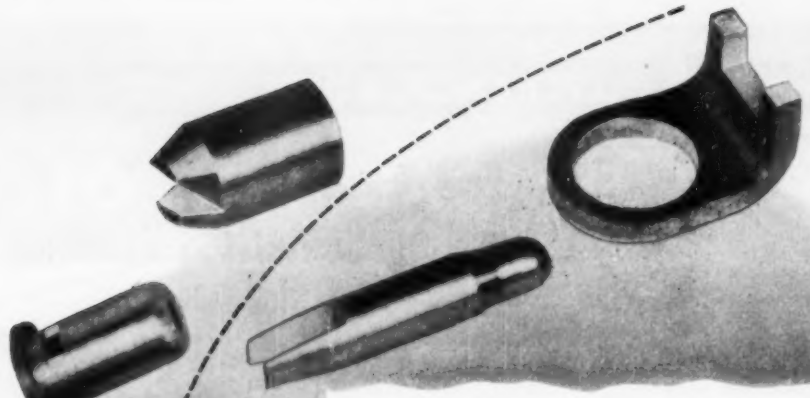


Example:

Regulating wheel diameter $d = 12$ in., its speed $N = 39$ rpm, and angle of inclination $\alpha = 3°$.

Solution:

1. Connect proper values on d and N scales, and find that value of $\pi\, dN = 1470$ approx.
2. Connect 1470 with $\alpha = 3°$. At intersection with T scale, find that time to grind one inch of work = 0.013 min approx.



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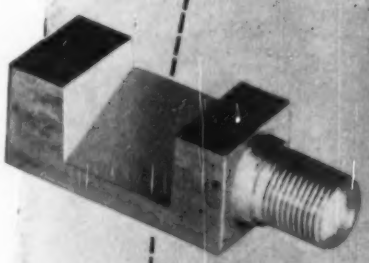

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Straight-Shank Twist Drills...I

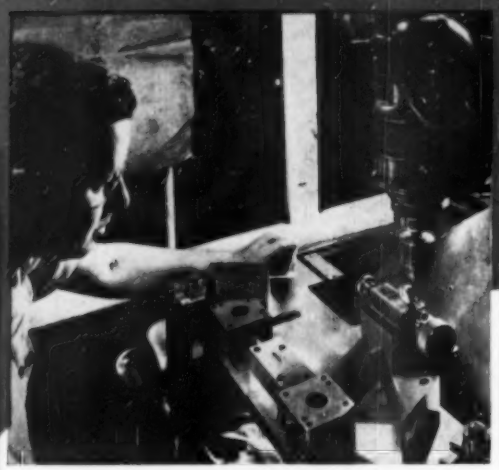
A tentative American Standard. As compared with earlier standards, the sequence of drill diameters has been changed to correspond with the actual sizes purchased and used by industry. Also the lengths of number, letter and fractional-size drills have been changed so that all three series have corresponding lengths.

Diameter of Drill	Decimal Equivalent	Short-Length Drills		Long-Length Drills	
		Over-all Length	Flute Length	Over-all Length	Flute Length
80	0.0135	5/64	1/16	...	...
79	0.0145	5/64	1/16	...	...
1/64	0.0156	5/64	1/16	...	...
78	0.016	5/64	1/16	...	...
77	0.018	3/64	1/16	...	...
76	0.020	3/64	1/16	...	...
75	0.021	1	3/64	...	...
74	0.0225	1	3/64	...	...
73	0.024	1 1/64	1/16	...	...
72	0.025	1 1/64	1/16	...	...
71	0.026	1 1/64	3/64	...	...
70	0.028	1 1/64	3/64	...	...
69	0.0292	1 3/64	1/32	...	...
68	0.031	1 3/64	1/32	...	...
1/32	0.0312	1 3/64	1/32	...	...
67	0.032	1 3/64	1/32	...	...
66	0.033	1 3/64	1/32	...	...
65	0.035	1 3/64	1/32	...	...
64	0.036	1 3/64	1/32	...	...
63	0.037	1 3/64	1/32	...	...
62	0.038	1 3/64	1/32	...	...
61	0.039	1 3/64	1 1/64	...	...
60	0.040	1 3/64	1 1/64	...	...
59	0.041	1 3/64	1 1/64	...	...
58	0.042	1 3/64	1 1/64	...	...
57	0.043	1 3/64	1/32	...	...
56	0.0465	1 3/64	1/32	...	...
3/64	0.0468	1 3/64	1/32	...	...
55	0.052	1 3/64	3/64	...	...
54	0.055	1 3/64	3/64	...	...
53	0.0595	1 3/64	3/64	...	...
1/16	0.0625	1 3/64	3/64	...	...
52	0.0635	1 3/64	3/64	...	...
51	0.067	2	1	...	...
50	0.070	2	1	...	...
49	0.073	2	1	...	...
48	0.076	2	1	...	...
5/64	0.0781	2	1	...	...
47	0.0785	2	1	...	...
46	0.081	2 1/64	1 1/64	...	...
45	0.082	2 1/64	1 1/64	...	...
44	0.086	2 1/64	1 1/64	...	...
43	0.089	2 1/64	1 1/64	...	...
42	0.0935	2 1/64	1 1/64	...	...
3/32	0.0937	2 1/64	1 1/64	...	...
41	0.096	2 3/64	1 3/64	...	...
40	0.098	2 3/64	1 3/64	...	...
39	0.0995	2 3/64	1 3/64	...	...
38	0.1015	2 3/64	1 1/16	...	...
37	0.104	2 3/64	1 1/16	...	...
36	0.1065	2 3/64	1 1/16	...	...
7/64	0.1094	2 3/64	1 3/64	...	...
35	0.110	2 3/64	1 3/64	...	...
34	0.111	2 3/64	1 3/64	...	...
33	0.113	2 3/64	1 3/64	...	...
32	0.116	2 3/64	1 3/64	...	...
31	0.120	2 3/64	1 3/64	...	...
1/8	0.1250	2 3/64	1 3/64	5 1/64	2 5/64
30	0.1285	2 3/64	1 3/64	...	...
29	0.136	2 7/64	1 3/64	...	...
28	0.1405	2 7/64	1 3/64	...	...
9/64	0.1406	2 7/64	1 3/64	5 1/64	3
27	0.144	3	1 7/64	...	...
26	0.147	3	1 7/64	...	...
25	0.1495	3	1 7/64	...	...
24	0.152	3 1/64	2	...	...
23	0.154	3 1/64	2	...	...
5/32	0.1562	3 1/64	2	5 1/64	3

Diameter of Drill	Decimal Equivalent	Short-Length Drills		Long-Length Drills	
		Over-all Length	Flute Length	Over-all Length	Flute Length
22	0.157	3 1/64	2	...	...
21	0.159	3 1/64	2 1/64	...	...
20	0.161	3 1/64	2 1/64	...	...
19	0.166	3 1/64	2 1/64	...	...
18	0.1695	3 1/64	2 1/64	...	...
11/64	0.1719	3 1/64	2 1/64	5 1/64	3 1/64
17	0.173	3 1/64	2 1/64	...	...
16	0.177	3 1/64	2 1/64	...	...
15	0.180	3 1/64	2 1/64	...	...
14	0.182	3 1/64	2 1/64	...	...
13	0.185	3 1/64	2 1/64	...	...
3/16	0.1875	3 1/64	2 1/64	5 1/64	3 1/64
12	0.189	3 1/64	2 1/64	...	...
11	0.191	3 1/64	2 1/64	...	...
10	0.1935	3 1/64	2 1/64	...	...
9	0.196	3 1/64	2 1/64	...	...
8	0.199	3 1/64	2 1/64	...	...
7	0.201	3 1/64	2 1/64	...	...
13/64	0.2031	3 1/64	2 1/64	6	3 1/64
6	0.204	3 1/64	2 1/32	...	...
5	0.2055	3 1/64	2 1/32	...	...
4	0.209	3 1/64	2 1/32	...	...
3	0.213	3 1/64	2 1/32	...	...
7/32	0.2187	3 1/64	2 1/32	6	3 1/64
2	0.221	3 1/64	2 1/32	...	...
1	0.228	3 1/64	2 1/32	...	...
A	0.234	3 1/64	2 1/32	...	...
15/64	0.2344	3 1/64	2 1/32	6 1/64	3 1/64
B	0.238	4	2 1/64	...	...
C	0.242	4	2 1/64	...	...
D	0.246	4	2 1/64	...	...
E & 1/4	0.250	4	2 1/64	6 1/64	3 1/64
F	0.257	4 1/64	2 1/64	...	...
G	0.261	4 1/64	2 1/64	...	...
17/64	0.2656	4 1/64	2 1/64	6 1/64	3 1/64
H	0.266	4 1/64	2 1/64	...	...
I	0.272	4 1/64	2 1/64	...	...
J	0.277	4 1/64	2 1/64	...	...
K	0.281	4 1/64	2 11/64	...	...
9/32	0.2812	4 1/64	2 11/64	6 1/64	3 1/64
L	0.290	4 1/64	2 11/64	...	...
M	0.295	4 1/64	3 1/64	...	...
19/64	0.2969	4 1/64	3 1/64	6 1/64	4
N	0.302	4 1/64	3 1/64	...	...
5/16	0.3125	4 1/64	3 1/64	6 1/64	4
O	0.316	4 1/64	3 1/64	...	...
P	0.323	4 1/64	3 1/64	...	...
21/64	0.3281	4 1/64	3 1/64	6 1/64	4 1/64
Q	0.332	4 1/64	3 1/64	...	...
R	0.339	4 1/64	3 1/64	...	...
11/32	0.3437	4 1/64	3 1/64	6 1/64	4 1/64
S	0.348	4 1/64	3 1/64	...	...
T	0.358	4 1/64	3 1/64	...	...
23/64	0.3594	4 1/64	3 1/64	6 1/64	4 1/64
U	0.368	5	3 1/64	...	...
3/8	0.375	5	3 1/64	6 1/64	4 1/64
V	0.377	5	3 1/64	...	...
W	0.386	5 1/64	3 1/64	...	...
25/64	0.3906	5 1/64	3 1/64	7	4 1/64
X	0.397	5 1/64	3 1/64	...	...
Y	0.404	5 1/64	3 1/64	...	...
13/32	0.4062	5 1/64	3 1/64	7	4 1/64
Z	0.413	5 1/64	3 1/64	...	...
27/64	0.4219	5 1/64	3 11/64	7 1/64	4 1/64
7/16	0.4375	5 1/64	4 1/64	7 1/64	4 1/64
29/64	0.4531	5 1/64	4 1/64	7 1/64	4 1/64
15/32	0.4687	5 1/64	4 1/64	7 1/64	4 1/64
31/64	0.4844	5 1/64	4 1/64	7 1/64	4 1/64
1/2	0.5000	6	4 1/64	7 1/64	4 1/64

BTR

The versatile, safe-hardening tool steel



Long-wearing qualities and easy machinability are important considerations in this accurate locating gage made from BTR for an engine mounting yoke. Made by Lacey Manufacturing Co., Bridgeport, Conn.

This BTR forming die gives dependable service in the production of front wheel housings at the Metropolitan Body Company, Bridgeport, Conn. BTR is safe-hardening, holds accurate size.

1. **Safe** — *Oil-hardens at 1475 F*
2. **Accurate** — *Holds close dimensions in hardening*
3. **Long-Wearing** — *Good wear-resistance for long runs*
4. **Tough** — *Excellent shock-resisting properties*
5. **Easy-Machining** — *Anneals to less than 202 Brinell*

BTR is popular because it combines so many desirable qualities. It's versatile. Veteran toolmakers like it because it performs well in such a wide range of tools and dies.

BTR reduces cracking hazards, for it hardens at 1475 F . . . it's easy to machine and heat-treat . . . it's tough, wear-resisting, deep-hardening . . . and it's a non-deforming steel you can depend on when extra accuracy is important.

Here's an economical grade that belongs in your toolroom. Use it as a general-purpose steel. You'll like the way it saves tooling time, reduces tool failure, prolongs production between grinds.

The nearest Bethlehem Tool Steel distributor or Bethlehem sales office can give you more complete details. Prompt deliveries from local stocks everywhere.

TYPICAL ANALYSIS:

C	Mn	W	Cr	V
0.90	1.20	0.50	0.50	0.20

HEAT-TREATMENT:

Anneal at 1450 F, furnace-cool, 202 Brinell
Harden at 1475 F, quench in oil
Temper from 325 to 400 F for a working hardness of 58 to 62, Rockwell C

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
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BETHLEHEM STEEL

SUPERSONIC TESTED

Bethlehem Tool Steel

Straight-Shank Twist Drills...II

Long-Length Drills in Sizes from 33/64 to 2.000 In.

Diameter of Drill	Long-Length Drills		Diameter of Drill	Long-Length Drills	
	Over-all Length	Flute Length		Over-all Length	Flute Length
33/64	8	4¾	1 1/64	11 3/16	6 5/16
17/32	8	4¾	1 1/32	11 3/16	6 5/16
35/64	8 1/16	4 7/16	1 3/64	11 5/16	6 5/16
9/16	8 1/16	4 7/16	1 1/16	11 5/16	6 5/16
37/64	8 5/16	4 7/16	1 5/64	11 5/16	6 7/16
19/32	8 5/16	4 7/16	1 3/32	11 5/16	6 7/16
39/64	8 5/16	4 3/16	1 7/64	11 5/16	7 3/16
5/8	8 3/8	4 7/16	1 1/8	11 5/16	7 3/16
41/64	9	5 1/16	1 9/64	11 3/16	7 1/4
21/32	9	5 1/16	1 5/32	11 7/16	7 1/4
43/64	9 1/16	5 5/16	1 11/64	12	7 5/16
11/16	9 1/16	5 5/16	1 3/16	12	7 5/16
45/64	9 1/16	5 5/16	1 13/64	12 1/16	7 1/16
23/32	9 1/16	5 5/16	1 7/32	12 1/16	7 1/16
47/64	9 5/16	5 7/16	1 15/64	12 1/16	7 7/16
3/4	9 5/16	5 7/16	1 1/4	12 1/16	7 7/16
49/64	9 7/16	6	1 17/64	14 1/16	8 1/16
25/32	9 7/16	6	1 9/32	14 1/16	8 1/16
51/64	10	6 1/16	1 19/64	14 5/16	8 5/16
13/16	10	6 1/16	1 5/16	14 1/16	8 7/16
53/64	10	6 3/16	1 21/64	14 5/16	9
27/32	10	6 1/16	1 11/32	14 1/16	9 1/16
55/64	10	6 1/16	1 23/64	14 7/16	9 1/16
7/8	10	6 1/16	1 3/8	15	9 5/16
57/64	10	6 1/16	1 9/16	15 1/16	9 5/16
29/32	10	6 5/16	1 5/8	15 5/16	9 7/16
59/64	10 5/16	6 1/16	1 11/16	15 1/16	10
15/16	10 5/16	6 1/16	1 3/4	16 1/16	10 1/16
61/64	11	6 1/16	1 13/16	16 1/16	10 1/16
31/32	11	6 1/16	1 7/8	16 1/16	10 1/16
63/64	11	6 1/16	1 15/16	16 5/16	10 5/16
1	11	6 1/16	2	16 1/16	10 5/16

TOLERANCES

Element	Range	Direction and Tolerance
Drill Diameter	Over 1/16 to 3/4 incl.	+0.0000 to —0.0015
	Over 3/4 to 1 1/16 incl.	+0.0000 to —0.0020
	Over 1 1/16 to 2 incl.	+0.0000 to —0.0025
Shank Diameter	Over 1/16 to 2 incl.	+0.0005 to —0.0030
Drill Over-all Lgth.	Over 1/16 to 1 incl.	+1/16 to —1/16
	Over 1 to 2 incl.	+1/16 to —1/16
Drill Flute Lgth.	Over 1/16 to 1 incl.	+1/16 to —1/16
	Over 1 to 2 incl.	+1/16 to —1/16
Back Taper*	Over 1/16 to 3/4 incl.	0.0002 to 0.0011 in. per in.
	Over 3/4 to 1 1/16 incl.	0.0002 to 0.0012 in. per in.
	Over 1 1/16 to 1 1/16 incl.	0.0002 to 0.0015 in. per in.
	Over 1 1/16 to 2 incl.	0.0002 to 0.0020 in. per in.

All dimensions are given in inches.

*The broad range of back taper permits the engineering design of various manufacturers to fall within the limits, without forcing the manufacturer to conform to any particular practice. The back taper per inch range indicated is provided for manufacturers' engineering practice only, so that selection may be made from within this range best to suit his practice.

Automotive-Series Drills

Diameter of Drill	Comparable Letter Fraction, No. or MM Drill	Shank			Short Lgth.		Long Lgth.	
		Dia Max	Dia Min	Lgth	Over-all Lgth	Flute Lgth	Over-all Lgth	Flute Lgth
0.2500	1/4	0.2485	0.2475	1 1/16	4 1/16	3 1/16	6 1/16	4 5/16
0.2520	6.40MM	0.2505	0.2495	1 1/16	4 1/16	3 1/16	6 1/16	4 5/16
0.2570	F	0.2550	0.2540	1 1/16	4 1/16	3 1/16	6 1/16	4 5/16
0.2610	G	0.2590	0.2580	1 1/16	4 1/16	3 1/16	6 1/16	4 5/16
0.2656	17/64	0.2636	0.2626	1 1/16	4 1/16	3 1/16	6 1/16	4 5/16
0.2720	I	0.2700	0.2690	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.2770	J	0.2750	0.2740	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.2812	9/32	0.2792	0.2782	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.2854	7.25MM	0.2834	0.2824	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.2913	7.40MM	0.2893	0.2883	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.2969	19/64	0.2949	0.2939	1 1/16	4 1/16	3 1/16	6 1/16	4 1/16
0.3020	N	0.3000	0.2990	1 1/16	4 1/16	3 1/16	7	4 11/16
0.3071	7.80MM	0.3051	0.3041	1 1/16	4 1/16	3 1/16	7	4 11/16
0.3125	5/16	0.3105	0.3095	1 1/16	5	3 1/16	7	4 11/16
0.3160	O	0.3140	0.3130	1 1/16	5	3 1/16	7	4 11/16
0.3230	P	0.3210	0.3200	1 1/16	5	3 1/16	7	4 11/16
0.3281	21/64	0.3261	0.3251	1 1/16	5	3 1/16	7	4 11/16
0.3320	Q	0.3300	0.3290	1 1/16	5	3 1/16	7 1/16	4 11/16
0.3390	R	0.3370	0.3360	1 1/16	5	3 1/16	7 1/16	4 11/16
0.3437	11/32	0.3417	0.3407	1 1/16	5 1/16	3 1/16	7 1/16	4 11/16
0.3480	S	0.3460	0.3450	1 1/16	5 1/16	3 1/16	7 1/16	4 11/16
0.3543	9MM	0.3523	0.3513	1 1/16	5 1/16	3 1/16	7 1/16	4 11/16
0.3594	23/64	0.3574	0.3564	1 1/16	5 1/16	3 1/16	7 1/16	4 11/16
0.3680	U	0.3660	0.3650	1 1/16	5 1/16	3 1/16	7 1/16	5 1/16
0.3750	3/8	0.3730	0.3720	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.3860	W	0.3840	0.3830	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.3906	25/64	0.3886	0.3876	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.3970	X	0.3950	0.3940	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.4062	13/32	0.4042	0.4032	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.4219	27/64	0.4199	0.4189	1 1/16	5 1/16	4 1/16	7 1/16	5 1/16
0.4375	7/16	0.4355	0.4345	1 1/16	6 1/16	4 1/16	8 1/16	5 1/16
0.4531	29/64	0.4511	0.4501	1 1/16	6 1/16	4 1/16	8 1/16	5 1/16
0.4687	15/32	0.4667	0.4657	1 1/16	6 1/16	4 1/16	8 1/16	5 1/16
0.4844	31/64	0.4824	0.4814	1 1/16	6 1/16	4 1/16	8 1/16	5 1/16
0.5000	1/2	0.4980	0.4970	1 1/16	6 1/16	4 1/16	8 1/16	5 1/16
0.5156	33/64	0.5131	0.5121	1 1/16	6 1/16	4 15/16	8 1/16	5 1/16
0.5312	17/32	0.5287	0.5277	1 1/16	6 1/16	4 15/16	8 1/16	5 1/16
0.5469	35/64	0.5444	0.5434	1 1/16	6 1/16	4 15/16	8 1/16	5 1/16
0.5625	9/16	0.5600	0.5590	1 1/16	6 1/16	4 15/16	8 1/16	5 1/16
0.5781	37/64	0.5756	0.5746	1 15/16	6 1/16	4 15/16	8 1/16	5 1/16
0.5937	19/32	0.5912	0.5902	1 15/16	7 1/16	5 1/16	9 1/16	6 1/16
0.6094	39/64	0.6069	0.6059	1 15/16	7 1/16	5 1/16	9 1/16	6 1/16
0.6250	5/8	0.6225	0.6215	1 15/16	7 1/16	5 1/16	9 1/16	6 1/16
0.6406	41/64	0.6381	0.6371	1 15/16	7 1/16	5 1/16	9 1/16	6 1/16
0.6562	21/32	0.6537	0.6527	1 15/16	7 1/16	5 1/16	9 1/16	6 1/16
0.6719	43/64	0.6694	0.6684	1 7/8	7 1/16	5 1/16	9 1/16	6 1/16
0.6875	11/16	0.6850	0.6840	1 7/8	7 1/16	5 1/16	9 1/16	6 1/16

TOLERANCES

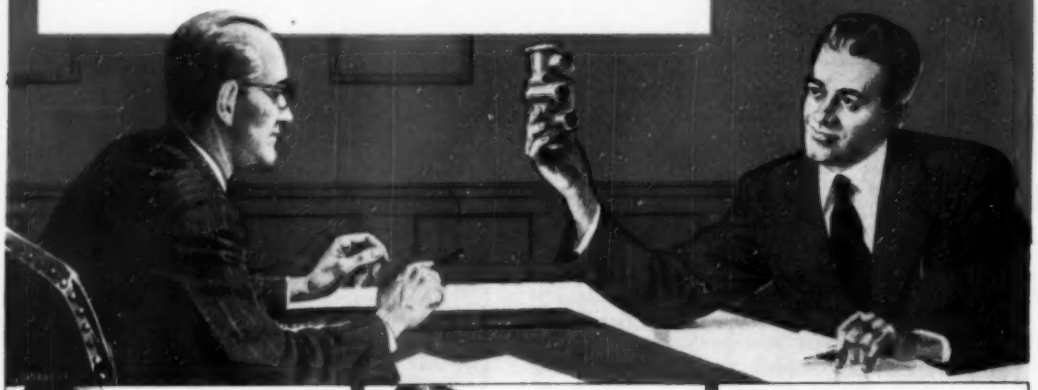
Element	Range	Direction and Tolerance
Drill Diameter	1/4	+0.0000 to —0.0010
	Over 1/4 to 11/16 incl.	+0.0000 to —0.0015
Drill Over-all Lgth.	From 1/16 to 1/2 incl.	+1/16 to —1/16
	Over 1/2 to 11/16 incl.	+1/16 to —1/16
Drill Flute Lgth.	From 1/16 to 1/2 incl.	+1/16 to —1/16
	Over 1/2 to 11/16 incl.	+1/16 to —1/16
Back Taper*	From 1/16 to 21/64 incl.	0.0002 to 0.0008 in. per in.
	Over 21/64 to 1/2 incl.	0.0002 to 0.0009 in. per in.
	Over 1/2 to 11/16 incl.	0.0002 to 0.0011 in. per in.

Said Mr. Winniger† to Mr. Hamilton‡

† Typical Manufacturer ‡ New Britain Sales Engineer

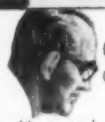
You bet, we're worried about manufacturing cost! Competition is cutting prices, wages are out of sight, and we have a pension plan staring us right in the face. But we don't operate a shop full of obsolete machines, our staff is fairly modern. Cutting costs further isn't going to be an easy matter.

Speaking of cutting costs, here's a piece that used to be turned out on three machines in a shop as modern as yours.



You sold a New Britain to replace the other machines?

Yes, it's a job that involves boring thru a seven inch piece. The other machine didn't have enough throw on the tool slide to bore thru, so the piece had to be re-chucked in a second operation. We go right thru in the one setting. Work of this type is handled on our standard machine eliminating special expensive holders and tooling.



Of course that saved a lot of handling and idle time.

It saved a whole machine and increased production besides. We also finish ream in the sixth position which eliminates a third boring operation leaving only a honing operation to bring the bore to within .0003 tolerance and surface finish.

A job like that interests me particularly — because it isn't some tricky special piece, but the sort of work you might find in any shop. When you can find a way to make a big cost reduction on this sort of part, you have something worth talking about. Have you got one of your New Britain Cost History sheets that gives all the dope on it?

We'll send it to you in a few days. Meanwhile, perhaps you'd like to have me do some checking on pieces you're turning out now, or getting ready to make.

Want to help me with my worrying, eh? Okay, I'll just take you up on that—Wait'll I phone Joe, and have him take you thru the shop.

Call on your New Britain Sales Engineer to help you find profit opportunities in metal cutting. Meanwhile, let us send you "It Can Be Done" with up-to-date cost histories on this and other special pieces.

N.B

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN-GRIDLEY MACHINE DIVISION

NEW BRITAIN, CONNECTICUT

TALKING SHOP

Another Co-Design

TINNERMAN PRODUCTS INC., Cleveland, has, like Skilsaw (*A.M.*, Jan. 9, '50), combined product design and tool engineering. An experimental press room is spotted right beside the engineering dept. and under direction of the chief engineer. A rough sketch can thus often be converted to 25 to 100 experimental fittings before the day is over. Temporary dies are used and the experimental pieces submitted to the customer. Meantime the shop may suggest modifications before the design is detailed by the engineering draftsman, even before experimental pieces are made. No final production tools are made until engineers, shop and customer all OK the design.

Stock Checked First

BERT BURRIDGE, chief inspector at Woodward Governor Company, Rockford, Ill., is using a GE metals comparator to control incoming bar stock and to separate chemically or physically mixed stock or parts. Machinability and plating or coating thickness determinations can also be done with the instrument. Several sizes of coils for high and low frequencies, as well as a special test head, make frequencies of 50-10,000 cps available. With frequencies above 1000 cps, non-ferrous metals may be tested. Comparisons are made with fixed standards and chemical and metallurgical tests.

da Vinci Foresaw

LEONARDO DA VINCI was far ahead of his time; he actually laid down the blueprint of our modern industrial age 500 years ago. He conceived the helicopter, the automobile (complete with accessories), the 3-speed transmission, right-angle drive with differential for vehicles, etc. Now the Edison Museum, Dearborn, Mich., has an exhibit with da Vinci's original sketches, and working models of each, to show how few of our "new" inventions are really new. The basic principles were known five centuries ago. After this showing, the models move to Buhl Planetarium, Pittsburgh.

Included are models of an airplane, helicopter, aerial bomb, parachute, printing press, coin stamper, spring-activated car, machine gun, and a jack (like our bumper jack). Some 68 models comprise the group. All were built by Roberto Guatelli, an Italian engineer, whose first set of models were shown in New York, then shipped to Tokyo, where they were destroyed in a fire raid during World War II. The present set has been shown in Los Angeles, Dallas and Denver.

Incidentally, da Vinci was ambidextrous, so could write with one hand and draw with the other. Guatelli estimates it would take one man (presumably monodextrous) 50 years to duplicate Leonardo's notes and sketches.

Big Ones Into Little Ones

CENTRIFUGALLY CAST stainless steel tubes, 5¾-in. OD and with 11/16-in. wall thickness, are the raw material for, of all things, hypodermic needles. Basic principle in making these needles is to start with a hole which is reduced progressively. The cast stock is machined inside and out to remove casting flaws, then reduced to 4½ in. OD by Tube Reducing Corp. After stress relieving, OD is again reduced to 3⅜ in., stress relieved, and further reduced to 2¼ in. OD. Process greatly increases physical properties, and insures concentricity of ID and OD. Final reduction to needle size is by a succession of cold-drawing operations.

"20 Questions" Backfires

WE'VE HEARD of one advantage of noise: In a Lancashire cotton town, a "20 Questions" feature was arranged as an employee-relations stunt, with local mill talent for the experts. According to R. E. Crawford, editor of "Canadian Machinery", no sooner was the audience shown the card with the answer to the problem than the boys on the stage had it. The professional producer was confounded; answers followed—or even preceded—the first question. What he didn't know was that cotton mills are so noisy that lip-reading is essential. The lads in the front row were mouthing the answers, and the experts read lips to knock the program haywire.

Two Million Bodies

FISHER BODY DIVISION, according to J. J. Cronin, v.p. & g.m. used in 1949:

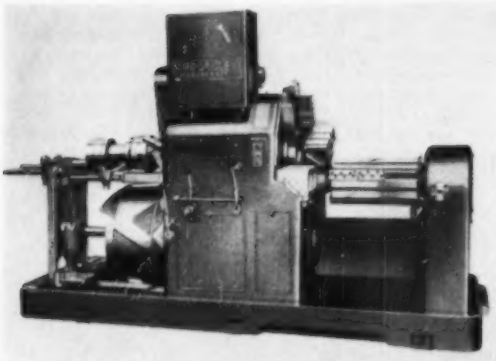
1,160,000 net tons of steel (1,500,000,000 sq ft)
51,000,000 sq ft of glass
16,639,758 lb of wool (from 6,800,000 sheep and making 17 sq miles of fabric)
78,000,000 lb of cotton
9,000,000 sq ft leather (189,000 cows)
150,000,000 ft of copper wiring
169,493,000 ft of weather strip

These went into 2,000,000 bodies.

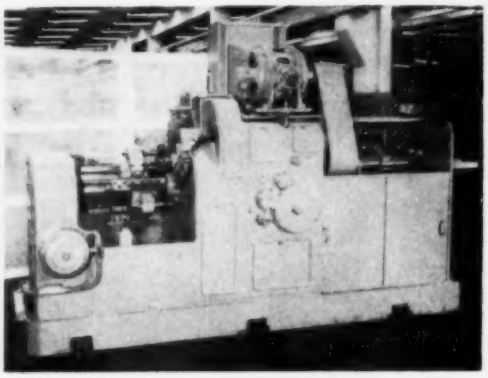
Ford Pays by Check

BOSTON'S million-dollar robbery emphasizes one of the hazards of cash payrolls. Although cash payment eases the worker's problem, it tremendously increases the danger of loss and/or robbery. Ford converted last July from twice-monthly to weekly pay—and converted to payment by check at the same time. To handle the 106,000 hourly employees, 83 special check-writing machines were installed, 59 in the Detroit area alone. The check-writer operator enters base wage, any overtime or premium pay, and the deductions. The machines put in recipient's name, compute net wage and write the check. Each machine averages 1300 checks a week.

New Shop Equipment



Five-slide turret swings between headstock and outboard support at right. Feed-control cam drum is at left



Main drive motor operates from top of machine. Indexing-mechanism has independent motor at left

Single-Spindle Bar Machine Engineered For Flexibility, Tooling Simplicity

The large open tooling zone of the Model M single-spindle automatic contains three cross-slides. Two lower angular-mounting slides are for heavy forming operations and the third slide is for cutoff. The indexing turret has five slides for end working and stock stop. Threading can be performed with self-opening dies or collapsible taps. The open tooling zone provides ease of operation and set-up from both sides—no interferences with any mechanical shaft from either side of the tooling area. A chip conveyor can be used if desired.

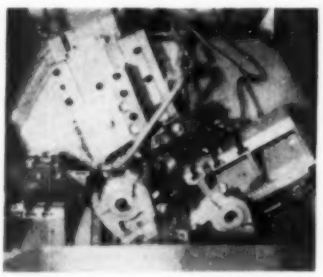
Wide Spindle-Speed Range

Spindle-speed change gears and three automatically controlled range gears provide a wide spindle-speed range. The machine is built in four sizes with the following spindle speed ranges; 2⅝ in., 150 to 1550 rpm.; 3½ in., 120 to 1220 rpm.; 4¾ in., 45 to 800 rpm., 5½ in., 28 to 545 rpm. The spindle drive is from the pulley shaft through change gears to a jack shaft, then to a clutch shaft where three clutch-controlled range gears provide as many as three different spindle speeds without changing the spindle change gears. Automatic control of the range gear clutches is from the main camshaft.

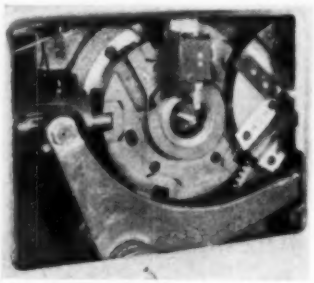
The turret is indexed with an independent motor by a Geneva movement, located in the outer support. Lock-bolt disk and lock bolt are also located in this housing. This is entirely independent of the toolslide and other machine movements, all of which are controlled by the main drive motor, located on top of the machine.

Tool Feed, Work Spindle, Coordinated

Feed control for the main camshaft is by direct drive from the main spindle so that the toolslide feed will always be in proper relation to the work spindle. The standard range of toolslide feed per spindle rpm is



Slides on headstock are for forming and cutoff. Two of the turret toolholders are seen in foreground



Turret-indexing and locking device (Geneva movement) in outer support is independent of cross-slide operation

Materials and Parts

from 0.004 to 0.0444. The machine can easily be arranged to provide a coarse and fine feed range in addition to the standard one using the same cam and feed change gears. Feed change gears and spindle-speed change gears are interchangeable the same as in the multiple-spindle machines. Idle-time movement such as chuck opening and closing, stock feeding, return of the toolslide, and other machine movements operated by the main drive motor, but not directly connected with the feed control are accomplished by the constant-speed shaft driven directly from the pulley shaft and independent of the spindle speed or feed.

Slides Independently Controlled

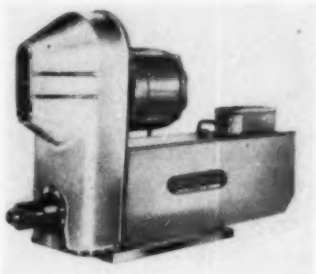
Cross-slides are independently operated by steel cams located directly underneath the slides while a third cam set provides independent operation of the cutoff slide. Each of the turret slides is also independently controlled by steel cams located on a cam drum in the headstock section. Stock is spring fed, controlled by guide bars from the feed tube and yoke. Backward movement of the feed mechanism is cam controlled and may be varied up to 10-in. feed length standard with longer feeds obtained by special setup. Main drive motor is a 60 cycle ac 1800-rpm unit. A dc motor can be supplied at additional charge.

The National Acme Co., 170 E. 131 St., Cleveland 8, Ohio

Bakelite-Base Paint Said to Be Canned Tile

Savinoleum is a bakelite-based product, suitable for use on machinery and industrial equipment, which dries to a tile-like finish. This "fluid tile," available in 14 colors, is said to dry from the inside out giving a heavy texture and eliminating brush marks. It can be applied to wood, linoleum, concrete, masonry, stone, metal, radiant-heated floors, walls, and pipes. The material dries quickly and is reported highly resistant to water, salt water, weak acids and alkalis, alcohols, grease, gasoline, oil, and heat. The cost is 2½¢ to cover one sq ft.

Pavinoleum, Inc., 34 Madison Ave., New York 17, N. Y.



Drilling, Tapping Machine Is Fully Automatic

The Auto-Drill is a production machine tool, for single and multiple setups, where a combination of reciprocating and rotary motion are necessary. It is suitable for drilling, reaming, boring, spinning, tapping, centering, and tube flaring. Standard stroke is 0 to 4 in., but special spindle stroke up to 18 in. can be obtained. The unit has rapid spindle travel to work, accurate depth stop, controlled end feed, and rapid withdrawal from work. Machines can be obtained with spindle-speed ranges of from 2500 to 850 or 5000 to 1700. The Auto-Drill is a complete unit in itself, only air and electric power being required to operate it. The unit is produced in sizes up to 5 hp and can operate on from 20- to 100-lb air pressure. Special attachments for skip drilling and in-and-out peck motion are also available.

Auto-Tool & Engineering Co., Chicago 47, Ill.

High-Speed Electrode For Steel Eliminates Slag Removal

The 5/32-in. Steel-Tectic electrode, which welds bead over bead without need for removing slag, can be used at currents as low as 50 amps on thin steel, without danger of burning through. Eutectic FrigidArc flux coating is said to be responsible for the performance of this electrode. It forms a protective envelope around the welder, permitting a spray deposit, free of weakening oxides and inclusions.

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.

...INCLUDING

Automatic vertical-spindle contour miller cuts intricately shaped cams ..... page 144

Retractable toolholder automatically withdraws tool from work at any desired point simplifying threading operations.. page 145

Punch, shear, and coper are combined in one unisteel-construction machine ..... page 146

Universal carbide tool grinder has both swiveling motor and swiveling table ..... page 148

Merry-go-round resistance welder has indexing mechanism, handles 2000 units per hr. ..... page 150

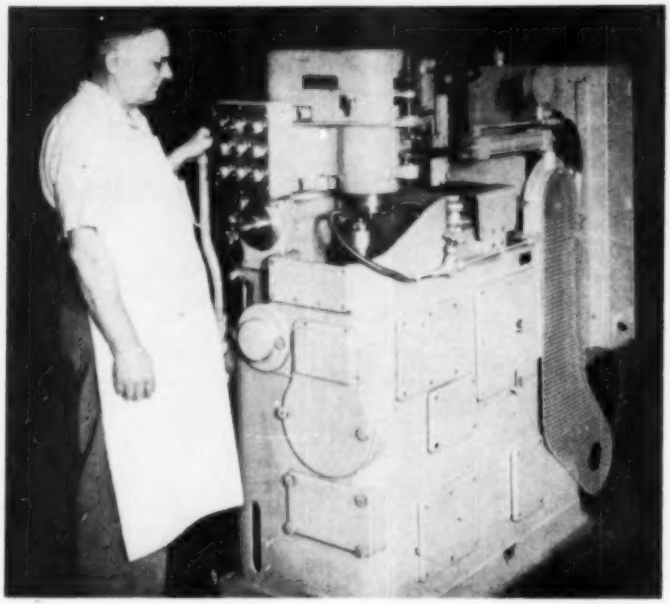
Universal punch is rated at 235-ton ram pressure and can punch 2½-in. hole through 1¼-in. mild steel ..... page 160

...and in March 20

Oil-hydraulic press has an eight-station air-operated dial index table. Reset timer facilitates automatic cycling.

Hydraulic forcing press of 150-ton capacity has maximum ram speed of 275 ipm.

Small-lot tumbling barrel is rotated by an inclosed variable-speed motor permitting any speed between 13 and 39 rpm.



Cam-Shaped Contours Milled By Automatic Vertical Unit

Production of small, intricately contoured parts is greatly simplified by this special vertical-spindle contour miller, jointly engineered by the Singer Mfg. Co., and Sundstrand Milling Machine Co. The machine is controlled by a master cam and will handle work up to 5-in. dia. Cutter spindle and cam-follower spindle are mounted on a pivoting arm to give 2:1 vertical ratio, reducing cam errors to one-half on the finished part. Ratio of the master diameter to the work diameter is variable and may be as great as 20:1.

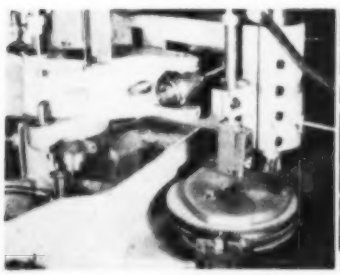
This miller cuts its own master cams. A rough blank is placed on the master table and a cutter and cutter spindle are substituted for the cam follower and spindle. A finished part is placed on the work table and a dummy substituted for the cutter. The main drive belt is then switched to the cam-cutting spindle and the new master is cut from the sample part.

The rotary table can be cycled to feed and rapid return in either direction up to 1 1/3 revolutions or any desired part of a revolution, and can be made to dwell at either or both start and stop positions. The cutter spindle has power vertical and horizontal feeds which, combined with the rotary-table movement, permit a choice of 24 different machine cycles. Vertical spindle movement permits milling internal contours as readily as external ones.

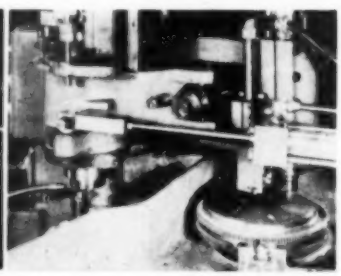
Designed primarily for production of high-carbon tool-steel sewing-machine parts, the miller is said to produce such accuracy and finish that parts require only tumbling for a highly polished finish that will not snag cotton or silk threads passing over them.

The machine is also adaptable to production of a wide variety of oddly shaped parts such as used in guns, business machines, governors, and other precise mechanisms.

Sundstrand Machine Tool Co., Rockford, Ill.



Contour control is by master cam, driven by the same variable-speed hydraulic motor as the rotary work table

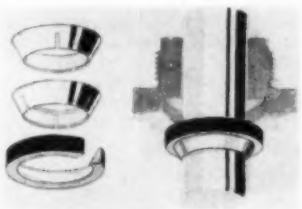


Procedure is reversed. Master cam is cut by using dummy cutter against finished work. Regular follower is replaced by cutter

Slide Calculator Selects Screws, Rivets, and Keys

The front side of the Elemoto slide gives US standard dimensions for coarse and fine-thread series. When the slide inside the housing is moved to the right or left, standard dimensions for each size from No. 0 to 4 in. are read in windows indicating dimensions on a blueprint drawing. Threads per inch, major and minor diameter, and headsizes are given. The reverse side of the selector gives similar material for Woodruff keys, American Standard pipe thread, and American Standard rivet heads.

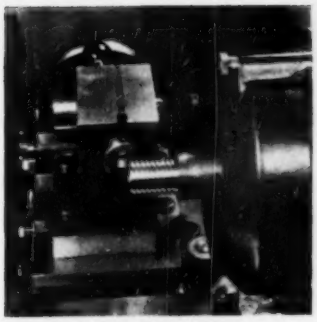
The Elemoto Sales Co., Teaneck, N. J.



Metallic Rod Wiper Protects Hydraulic, Pneumatic Cylinders

The Seal-Guard metallic rod wiper is for protection of hydraulic and pneumatic cylinders, shielding rods, and packings from abrasive foreign elements. Two flexible bronze rings, mounted in synthetic rubber, lift harmful substances completely off the rod by means of knife-edged conical surfaces. The units are said to be self-adjusting.

Hydraulic Accessories Co., 749 Beaubien St., Detroit 26, Mich.



Retractable Toolholder Simplifies Threading Operation

Threading toolholder, for use on the cross-slide of Warner & Swasey turret lathes, automatically withdraws the tool from the work at any desired point. This permits cuts at full speed, close to shoulders, without the necessity for close attention by the operator.

The attachment incorporates a spring-release mechanism which is cocked by handle to move the tool forward, and released by a positive-adjustment screw stop, attached to the headstock. This stop actuates a cam rod in the attachment to snap the tool back from the work. The tool holder is applied in conjunction with the Warner & Swasey apron-mounted chasing-screw attachment, permitting any standard pitch from 4 to 32 to be cut from the square turret. It can be furnished for use at the front of the cross-slide or, with extra linkage, at the rear.

The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 5, Ohio

Molybdenum Lubricant Forms Film on Friction Surfaces

Molybdenum-base lubricant, Liqui-Moly, can be applied alone or added to other oils which carry it to friction surfaces where it plates out on the metal, providing a permanent, low-friction, anti-seizing coating. It is said to be practically indestructible at high temperatures and does not squeeze out at high pressures, protecting the bearing against scoring even after oil may have been burned out. Tests are reported to have shown that friction surfaces running at high speeds and under heavy pressure will heat up from 300 to 504% faster with ordinary lubricating oil than when running dry with only Liqui-Moly. This lubricant is available for experimental purposes in sample quantities at $2 per lb.

The Lockrey Co., College Point 1, N. Y.

Stroke Counter Provides Visual Printed Production Records

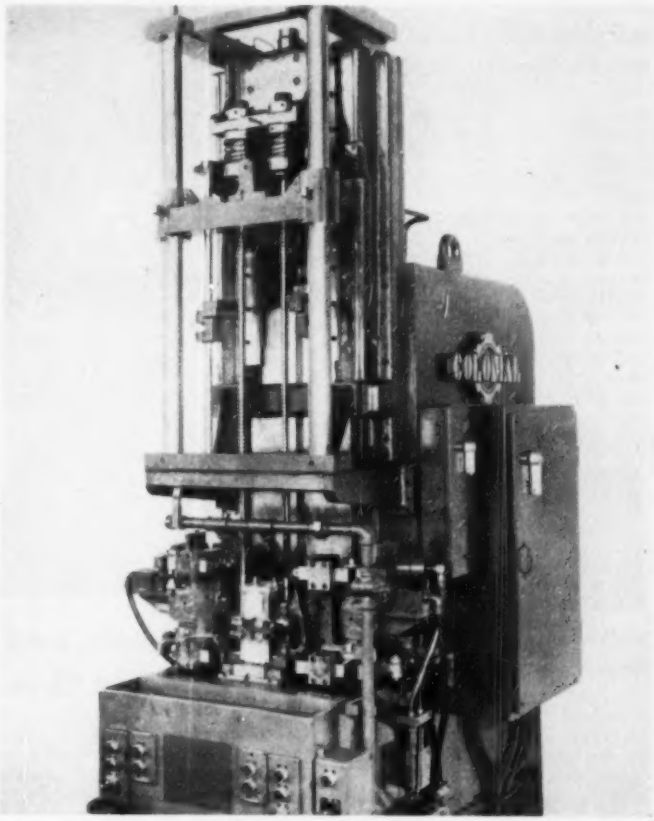
Model PVR is a stroke printing counter which provides both visual and printed records of machine production. The reading line shows the quantity registered in the counter and an upward stroke of the printing lever prints the figures on a sheet or record form. This form may be a single card or multiple sheets, copies of which can be used as route or job tickets, time cards, or cost cards. The count can be accumulated for a particular time period or reset to zero after each run. Printing action is accomplished by moving the lever through a 90° arc at which point figures are printed on the form. The ribbon is capable of recording over 400 impressions at one point and knobs on either ribbon spool change the position when the 45-in. ribbon lose its intensity at a given point.

Durant Mfg. Co., 1929 North Buffum St., Milwaukee 1, Wis.

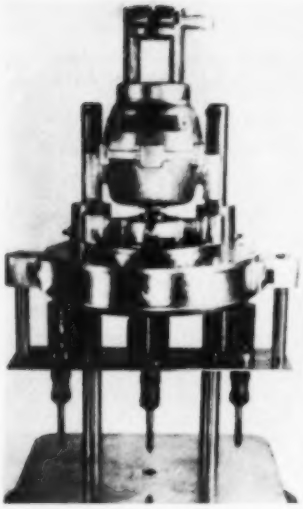
Electric Heating Elements Built in Standard Size Racks

Standard size folded-and-formed heating racks can be arranged horizontally or vertically in all types of equipment to supply from 1.5 to 300 kw. Construction is of continuous-ribbon elements, located in high-temperature refractory porcelains, supported on steel or stainless-steel frames, 12 in. square. Racks are drilled for mounting. The units carry a five-year guarantee at temperatures up to 750 or 1350 F.

Trent, Inc., 4599 Wilde Street, Philadelphia 27, Pa.



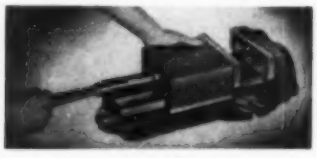
PULL-DOWN BROACHING MACHINE with special fixturing broaches two steering knuckle supports. Automatic operation of this 10-ton, 54-in.-stroke machine includes clamping by spring-loaded clamps to prevent jamming or breakage in case of oversized forgings. Expanding jacks supported inside faces of the knuckle-support bosses provide for accurate locating of broach holes and prevent distortion of the part—*Colonial Broach Co., Detroit, Mich.*



Multiple Drilling, Tapping Head Has Adjustable Spindles

Quick spindle adjustments can be made from a minimum center distance of 1 1/16 in. to a maximum center distance of 7⅝ in. on this adjustable-spindle multiple head. The unit is for drilling or tapping parts with hole sizes up to and including 5/16-in. steel and can be operated on any drillpress. The spindle can also be located at any point within a 3 5/16-in.-dia circle. The templet method is used to locate spindles accurately for given hole combinations and to change the setup from one operation to another. Units are available with two to five spindles.

Etteo Tool Co., Inc., 59½ Johnson Ave., Brooklyn 6, N. Y.



Machine Vise Provides Quick Closing, Strong Grip

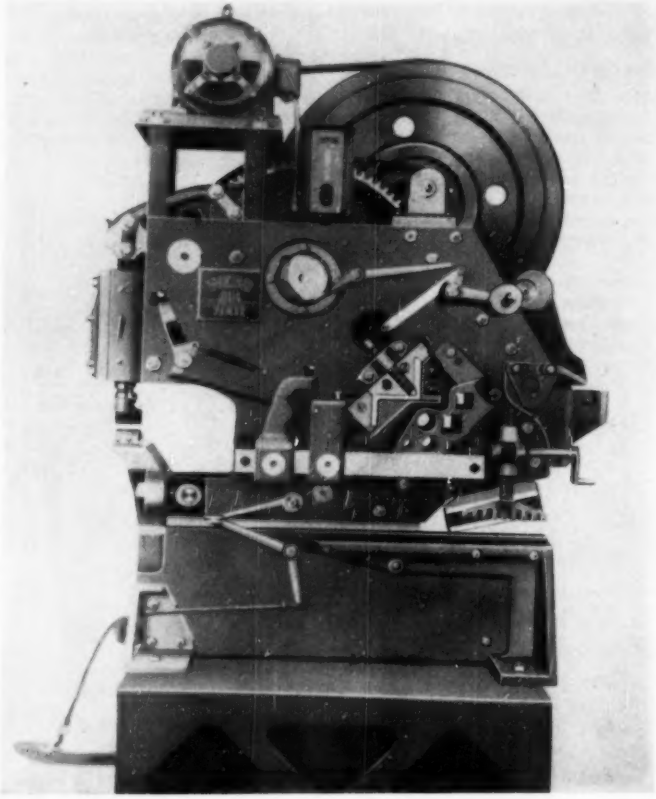
The Ames vise for milling machines, drillpresses, and shapers has 8-in.-wide jaws that open a full 11 in. To operate, wrench is placed in position shown, turned left two complete revolutions to release sliding block. Block is then slid up to work at which time the wrench is turned to the right until the jaws tighten. The wrench can then be connected in vertical position to provide leverage.

Ames Precision Machine Works, Waltham 54, Mass.

Steel-Hardening Compound Has Nitriding, Alloying Effects

Hard'N'Tuff hardening compound is claimed to impart to SAE 1020 or tool-steel drills a guaranteed increase of 300% in tool life. Said to have both a nitriding and alloying effect, this chromium compound, when fused into steel, forms a hard outer surface, highly resistant to wear, corrosion, and high temperatures. The process involves heating the tool to a cherry-red color, dipping or rolling it in the compound, and letting the compound fuse for 15 to 30 sec. The tool is then re-heated to a cherry red and quickly quenched in cold water. Hard'N'Tuff contains no cyanide or other toxic ingredients. Manufacturers say it can be used successfully on all types of tools, parts, dies, and other low-carbon or high-speed materials. It is packed in 3-, 5-, and 10-lb. cans; 25, 50, and 100-lb drums. Price is $8.75 per lb.

Doughty Laboratories, Inc., 299 Madison Ave., New York 17, N. Y.



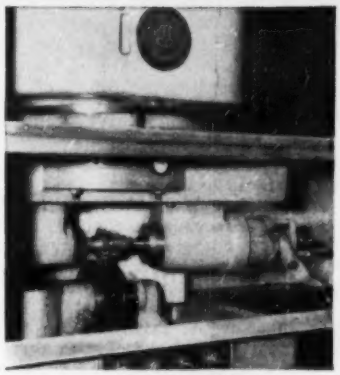
Punch, Shear, and Coper Combined in One Machine

Combination unit, called the Steelworker, is for use in plants regularly having punching and shearing work to do. The entire machine is of unisteel construction with steel plate accurately fitted together and machined throughout. At one end of the Steelworker is a punch, and at the other end a shear with a shearing capacity of ½-in. plate. The machine also contains a section cutter for cutting angles, T's, or Z sections. It is capable of either straight or miter cut, as well as straight cutting of round and square bars. In addition a coping or notching attachment can be provided for coping I-beams and channels or notching angles. The machine is powered with a 3-hp motor and the approximate shipping weight is 3400 lb.

The Webb Corp., Webb City, Mo.

CUTTING GEAR COSTS ISN'T *Difficult*

here's how one producer did it . . .



STEP NO. 2 **He reduced total cutting time and tool costs by ADDING underpass gear shaving.**

Time for hobbing plus underpass gear shaving on Michigan 870s is only 85% of previous cutting time.

Tool cost for both operations is less than for tools used previously.

STEP NO. 3 **He reduced pre-shave cutting and down-time *(and pre-shave tool costs)* with a Michigan Shear-Speed machine.**

Cutting time is now only a little over a minute per gear (heavy duty gears). Equals output of 8 to 10 other gear cutting machines.

Operator effort reduced (operator actually "works" only one hour out of eight).

Down-time for change-over for Shear-Speed is below that on previous machines for same output. 70% of gears for 3 transmission types now cut on this one machine.

Entire cost of tools (initial and replacement) for the Shear-Speed were more than paid for by savings in sharpening time alone.

QUALITY? The complete new "Michigan" setup according to the gear producer gives him: More accurate involute and spacing (better contact); longer life; *variation off shaving machines of only plus or minus 0.0001 in.*

STEP NO. 1 *Oh yes, we should have put this first. Step No. 1 was to call in a Michigan Tool Company representative.*

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY 7171 E. McNichols Road Detroit 12, U.S.A.

Hydraulic Power Bender Built With Automatic Angle Control

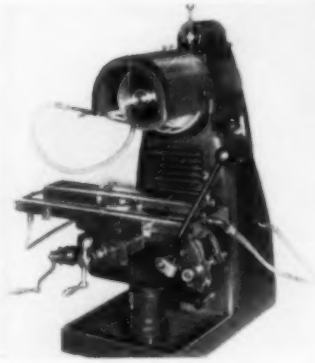
Developed to meet requirements for bending material somewhat beyond the capacity of hand-operated units, or to handle production runs which would make manual operation impractical, the Di-Acro Hydro-Power bender handles tubing, angle, channel, extrusions, moldings, strip stock, bus bars, round or square rods, and other solid ductile materials. An automatic angle control facilitates a series of progressive bends at varying degrees in a single part without removing the piece from the machine. Multiple-length gage is provided for duplicating large quantities of identical parts. The unit can also perform compression bending by wrapping the material around a stationary form. Bending motion can be operated in either direction., A variable-flow control valve allows infinite bending-speed adjustment. The bender comes in two models, No. 6 with toggle clamp and forming roller, and No. 8 with mounting plate and forming nose.

O'Neil-Irwin Mfg. Co., 257 Eighth Ave., Lake City, Minn.

Internal Gears, Splines Checked Without Disturbing Mounting

A combination of adjustable, self-centering teeth in conjunction with dial indicators provide a gear-and-spline portable comparator for checking internal teeth. By enabling operators to check gears and splines in the machine, these comparators permit setting of the cutter head for proper depth of cut to maintain size. The unit is claimed to offer the only visual means for checking internal gears and splines and the adjustable self-centering teeth are said to reduce replacement costs, by compensating for wear automatically. They can also be adjusted for engineering changes.

MP Tool and Engineering Co., 2339 Caniff Ave., Detroit 12, Mich.



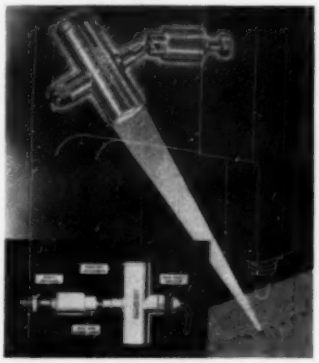
Universal Carbide Tool Grinder Designed for Diamond Wheels

Bench-type tool grinder, designed especially for use with diamond wheels, can be employed as a surface grinder, a chip-breaker grinder, or a universal tool and cutter grinder. It is provided with both a swiveling table and swiveling motor with micrometer settings for accurate grinding and resharpening of cutters, reamers, and counterbores. Lever and hand wheels, in front of the machine, provide vertical, longitudinal, and traverse table movement. Micrometer scales are incorporated for close settings and the table has two T-slots for adjustable stops.

Grinding wheels are mounted directly on the 1¼-in. ball-bearing spindle or on either of two adapters which give spindle extensions of 2⅛ and 5⅜ in. Motor and wheel can be set in any position 20° either side of vertical center. Coolant is supplied by a centrifugal pump delivering 12 gal. per hr. Two coolant adapters are used; one for grinding and one for cutting off and chip-breaker grinding. A 1½-gal. reservoir is built in the base of the machine.

The unit is powered with a special 2850 rpm 1-hp reversing motor. Motor can be reversed as many as 70 times per min without harming the windings. Standing 31¾ in. high the grinder covers a 30x30-in. area Table size is 17x5 in. Dust covers protect all sliding surfaces.

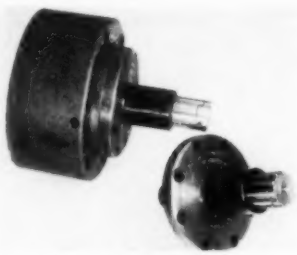
Wickman Mfg. Co., 15531 Woodrow Wilson Ave., Detroit 3, Mich.



Spotlight for Blind Jobs Equipped With Focusing Lens

Blind spots in machining or welding operations can be brought to light with the Sciaky locating spotlight. It is positioned on a ball-and-socket joint and provides a special lens for focusing the light beam, which can be adjusted to as small as ⅛-in. dia. The light can be equipped with a transformer of 110 or 220 volts.

Sciaky Bros. Inc., 4915 West 67th St., Chicago, Ill.



Spline Chucks Built With Interchangeable Tooth Members

Adjustable self-centering spline adapters for parts with different tooth specification can be changed in MP adjustable spline chucks in a few minutes. The entire chuck does not have to be changed in changing jobs. These units are said to provide a positive, accurate, and rapid means for locating from the pitch diameter and effective major diameter of the spline, for machining in qualifying cuts as well as heavy cuts in rough forgings and castings.

MP Tool and Engineering Co., 2339 Caniff Ave., Detroit 12, Mich.

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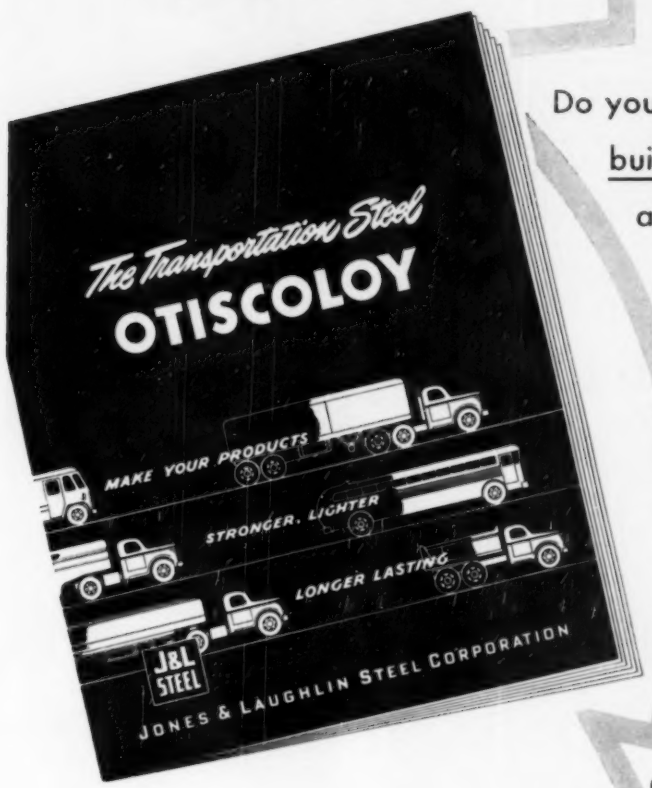

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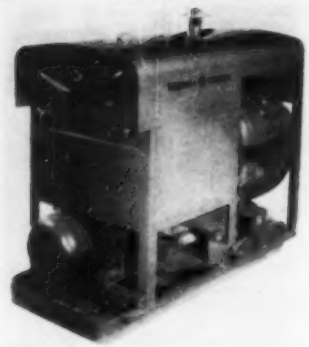


Mobile Dc Arc-Welder Unit Incorporates Slowdown Control

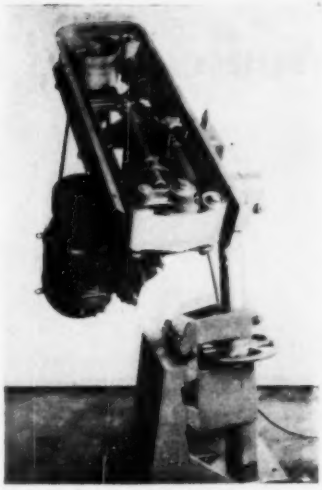
General-purpose WE-42AGW welder is driven by a 31-hp Wisconsin VP-4 air-cooled engine equipped with a magneto ignition. This heavy-duty unit weighs 1050 lb and has a rated output of 200 amp at 40 v. A manually operated slow-down control is included to economize fuel by setting the engine to idling speed when not holding a welding arc.

General Electric, 1 River Rd, Schenectady 5, N. Y.

Rotary Automatic Index Tables Available With 4 to 12 Stations

The table of this automatic indexing unit rotates on hydrostatic bearings, eliminating metal to metal contact during indexing, and thus permitting higher table loading and less hp input. Table diameters vary from 24 to 36 in., and units may be obtained with 4 to 12 stations inclusive. The entire indexing head is self-contained, built on unit-construction principle, and includes all motor and drive assemblies, directly beneath the table. Drive consists of modified Geneva with hardened and ground shot bolt for accurate location. Indexing time is $1\frac{1}{2}$ sec with accuracy between indexes of $\pm$ 0.001. The unit is available in automatic, semi-automatic, or with pushbutton control, with or without jogging.

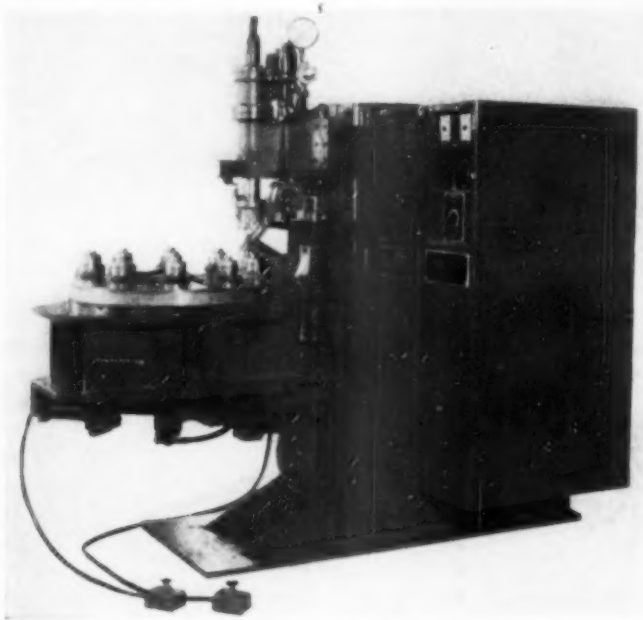
The Avey Drilling Machine Co., Inc., Cincinnati 1, Ohio



Abrasive-Belt Polishing Head Has 3000-8000 Sfpm Speed Range

Universal adjustment for any angle position within 120° arc is obtained through slide and pivot adjustments on the Model 6120 abrasive-belt head. Initial and final setting of the abrasive belt to the workpiece is made through handwheels and ratchets operating ball-bearing slides. The unit also provides controlled air tension, a floating contact wheel, positive tracking, and adequate guarding. Maximum belt size is 6-in. width by 120-in. length and speeds may be set anywhere from 3000 to 8000 sfpm.

Hammond Machinery Builders, 1600 Douglas Ave., Kalamazoo, Mich.



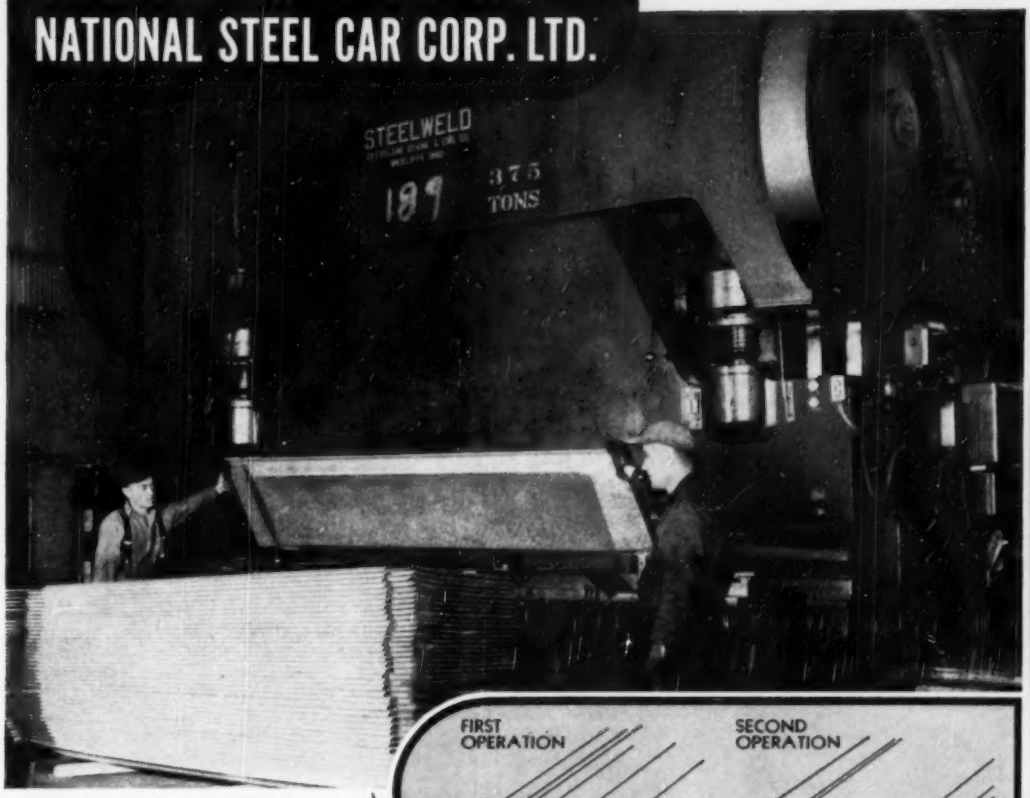
MERRY-GO-ROUND RESISTANCE WELDER employs indexing mechanism to weld seven-part electric motor housings. Parts are loaded on a 10-station indexing table by hopper and magazine feeds and welded at the rate of 2000 units per hr. Thickness of parts welded are 0.017, 0.023, and 0.029 in. cold-rolled steel. The welder operates on a power rating of 100 kva.—*Scioky Bros., Inc., 4915 W. 67th St., Chicago, Ill.

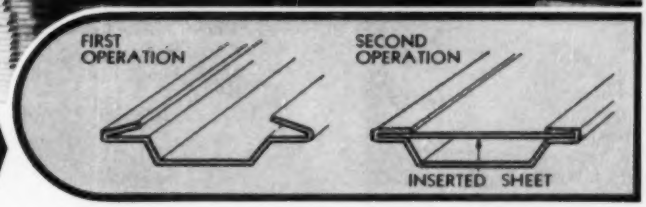
Hammer Has Replaceable Head

The metal parts of this replaceable-face hammer are finished in rust-inhibiting aluminum coating, baked on to give hard-wearing surface. The jaws of the retaining head are designed with free play to insure a positive take-up and firm grip despite variations in the circumference of faces. Raw hide, Basa molded composition, plastic, copper, and babbitt faces are available.

Greene, Tweed & Co., North Wales, Pa.

STEELWELD PRESSES SERVE NATIONAL STEEL CAR CORP. LTD.





Flue panels for Canadian Pacific Railway refrigerator cars are shaped on this 375 ton press as illustrated in sketches.

Two Steelweld Presses installed in 1937 and 1941, at National Steel Car Corporation, Limited, Hamilton, Canada are operated continuously for various forming and punching operations on metal from 18 gauge to ½ inch.

As this company is a large builder of cars for railroads all over the world, there is an endless variety of work for the presses to perform. The flanging operations on the ventilating panels shown above are typical.

National Steel Car like particularly the heavy construction of Steelweld Presses and the fast production to close tolerances possible with them. They feel there are no better presses for their work.

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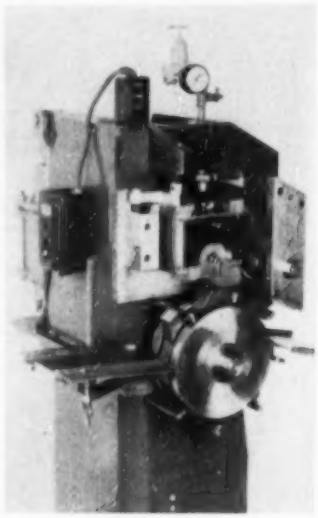
Elastoplastic caps are designed to fit over ⅜-in. Alemite dot fittings to prevent dirt from lodging on the tip. Made of black, flexible, vinylite, these caps are easily applied and removed, and hold by friction fit. They are not affected by oil, grease, or gasoline.

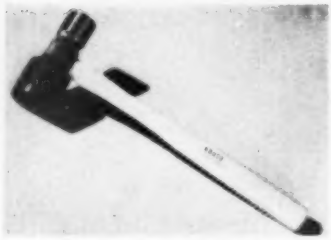
S. S. White Dental Mfg. Co., Plastics Div., 10 E. 40th St., New York 16, N. Y.



Automatic Marking Machine Handles Round Metal Parts

Such articles as studs, rods, and bushings can be marked on this heavy-duty machine. It is constructed with a horizontally positioned main spindle with a vertical carrier dial. The rotating dial picks up work pieces from a gravity feed and carries them to the marking station where they are marked and automatically unloaded. The machine is equipped with a floating die holder, mounted on a rigid shaft, which operates against a mill-type air cylinder acting as a cushion to compensate for diameter variation from one part to another. The air pressure controls the depth of marking. The main spindle is mounted on antifriction bearings. The machine comes with electric and pneumatic controls.

The Noble & Westbrook Mfg. Co., East Hartford 8, Conn.



Steel, Rubber Heads Combined in One Hammer

The Bar M all-purpose mechanic's hammer combines on one handle a drop-forged steel head and a rubber head. The medium-hard rubber head is pressure locked on a drop-forged steel base, and is said to have a low blow-recoil factor. The hammer is available at present in the 40-oz size.

The Mondie Forge Co., 1027½ Bevea Road, Cleveland 2, Ohio

Aluminum Brazing Wire Sold In 3/32- and ⅛-In. Diameters

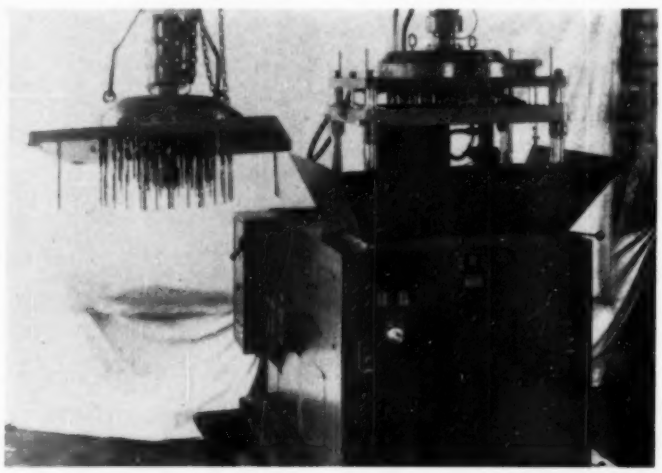
No. 718 aluminum brazing wire which replaces No. 716, is, according to the producers, more resistant to corrosion and produces high-pressure fittings with fewer leaks than wire formerly sold. It is sold in 3/32- and ⅛-in. dia and the standard package for each coil is approximately 55 lb. A light aluminum brazing flux is recommended by manufacturers for use with this wire.

Air Reduction Sales Co., 60 E. 42nd Street, New York 17, N. Y.

Portable Dust Collectors Handle 400, 900, or 1800 Cfm

Heavy-duty portable type-M units handle dust from grinding, buffing, and polishing machines and are available in 450-, 900-, and 1800-cfm models. Units can be set anywhere to serve one or several machines for any period of time, and are easily moved to meet changing needs. Each unit consists of motor, exhauster, centrifugal precleaner, and steel-wool-filter aftercleaner. Dust receptacles are gasketed sliding drawers secured with a handwheel to insure a leak-proof seal. For returning cleaned air to the building, the unit may be equipped with both exhaust tanks and filters.

The Kirk & Blum Mfg. Co., 2838 Spring Grove, Cincinnati 25, Ohio



ZAGAR DRILLING MACHINE, built on gearless-drillhead principles, drills approximately 100 closely spaced holes simultaneously in large aluminum castings. Holes range from ⅛- to ⅝-in. dia. The drillhead is driven with a hydraulic motor and feed is accomplished with a vertical ram which presses the work into the drill.—*Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio*

P&H helps you cut fabricating costs on "hard-to-weld" steels •

Have superior physical qualities — ideal for welding heavy sections that must withstand severe shock and abuse.

Low-Hydrogen Electrodes

- ***For problem steels:*** High carbon, high sulphur, cold-rolled, alloy... *70LA.*
- ***For steel castings repair:*** matches analysis and heat-treating properties of Grade B castings... *P&H25C.*
- ***For welding nickel-alloy steels;*** gives high impact resistance at low temperatures... *75LP.*
- ***For chrome-moly steels*** (1% Cr., ½% Mo.) used in power piping ... *80LE.*
- ***For chrome-moly steels*** (2% Cr., 1% Mo.) used in power piping ...*90LE.*
- ***To match heat-treating properties of SAE 1040*** and like steels. Also for steel-castings repair... *P&H40C.*
- ***For welding high hardenable steels.*** Also steel castings repair... *AW2B.*
- ***For repair welding Grade C castings*** and steels of similar composition... *P&H#7.*
- ***Comparable to SAE 8630 steel***...excellent heat-treating and flame-hardening characteristics... *90LH#2.*
- ***For welding high hardenable steels*** without preheat such as re-rolled rail stock... *P&H#12.*
- ***For aircraft and similar steels*** . . . has wide range of properties under heat treatments... *P&H#21.*

Withstand high amperages and have high deposition rate. Operators burn more rod per hour, weld faster at lower costs.

These rods operate with stable arc on AC or reverse-polarity DC. Other money-saving features are: Elimination of underbead cracking. Low hydrogen content for successful enameling. Little or no preheating. Minimum spatter. Excellent appearance of weld... freedom from surface holes. Order from your P&H representative or local P&H distributor. Send coupon for detailed information.

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4514 W. National Ave., Milwaukee 14, Wis.

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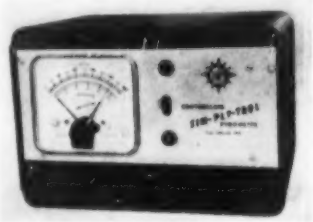
Fractional-Hp Shaded-Pole Motors Operate in Any Position

Lifetime-lubricated motors are available in either opened or totally-inclosed construction in sizes from 1/40 to 1/12 hp, at 115 or 230 v, 1050 or 1550 rpm, 60 cycles. They are designed for operation with the shaft in any position. Oil-saturated packing continuously feeds the bearing with filtered oil; no additional lubricant is ever required. The motor is of unit-bearing construction in the shaft end, and is equipped with vibration-absorbing resilient end rings, said to be resistant to oil and aging.

General Electric Co., Schenectady 5, New York.

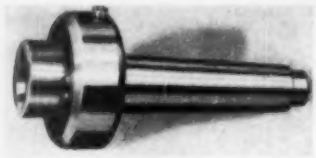


Automatic Controller for Current, Voltage, Heat Regulation

The Simplytrol contact meter-relay indicating and controlling unit, for processes and operations, is available in all ranges of voltage and current. In the sensitive ranges it is responsive to changes of one-half microampere or a fraction of a millivolt. Calibrated in millivolts and furnished with dial graduations marked in degrees of temperature, this controller is said to make an easily installed highly accurate pyrometer control.

With instrument rectifiers and current transformers the Simplytrol will indicate and control alternating currents and voltages. The unit consists of a contact meter relay with built-in micro-contacts, load relay, rating at 15 amp, 115 v or 7½ amp, 230 v load, and an interruptor relay for a micro-contact locking circuit. An isolating power transformer with 110- and 220- v connections, rectifier, and filter system is included.

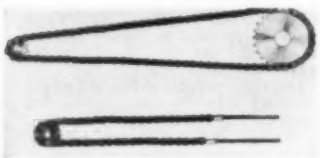
Assembly Products, Inc., Chagrin Falls, Ohio



Female Live Centers Support Centerless Shafts

Female live centers, designed especially for supporting centerless shafts, are available in two sizes, one with No. 3 Morse taper shank and maximum work capacity of 1 in. and the other with No. 2 Morse taper shank and ¾-in. work capacity. Both sizes will take work diameters down to 5/16 in. The revolving center is made from electric-furnace steel, heat treated to a hardness of 61 to 65 Rockwell C. The center shaft extends through the taper shank. A precision ball bearing carries both the radial and thrust loads of the work and a plain pilot bearing eliminates center-shaft whip.

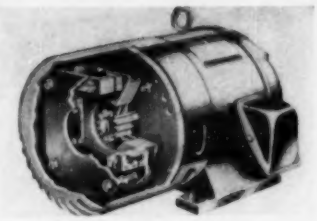
South Bend Lathe Works, South Bend 22, Ind.



Miniature Sprocket Chains Non-Magnetic, Non-Corrosive

Load-carrying chains and stud chains with non-corrosive and non-magnetic qualities are designed for use around very small pulleys and sprockets. Stainless-steel chain is used for most applications and beryllium-copper chain was developed for applications requiring completely non-magnetic materials. Load-carrying chains in either material weigh approximately ¾ oz per lineal ft, and the stud chain, approximately ½ oz per lineal ft. The former chain has a yield strength of 310 lb and an ultimate strength of 425 lb. The stud chain will operate around a 7 tooth sprocket with minimum dia of 0.395 in.

Franklin C. Wolfe Co., 407 Commercial Center St., Beverly Hills, Calif.



Shaft Shortened, Magnet Relocated on Star Brakemotor

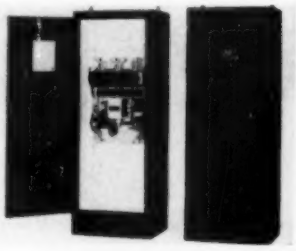
Braking disks of the Star Brakemotors are mounted close to the motor with a shorter shaft to minimize strain and wear on shaft and bearings. Magnets are located away from the motor for maximum heat dissipation. Tension springs are installed on main brake studs to facilitate easy adjustment. The brake cover is streamlined and readily removable.

Star Electric Motor Company, Bloomfield, New Jersey

Thread Plug Gages Said To Reduce Wear Allowance

Reversible carbide plug gages are offered in all sizes from No. 5 to 40 NC, NF, NEF, and special sizes. Hardness of material and accuracy of the gages are claimed to virtually eliminate gage-makers' wear allowances. This permits passage of piece parts which might normally be rejected for rework or scrapping.

Size Control Co., 2500 W. Washington Blvd., Chicago, Ill.



Larger Units Added to Allen-Bradley Starters

Sizes 6 and 7 ac across-the-line solenoid starters have one-piece magnetic plungers which operate with a vertical straight-line motion. Fully inclosed, double-break, silver-alloy contacts require no cleaning, filing, or dressing. Size 6 is rated at 600 amps, 200 hp 200 v or 400 hp, 440-550 v, and Size 7, 900 amps, 300 hp, 220 v or 600 hp, 440 v.

Allen-Bradley Co., Milwaukee, Wis.

THE WARNER & SWASEY

CROSS SLIDING HEX TURRET LATHE

...a natural for small lot chucking problems

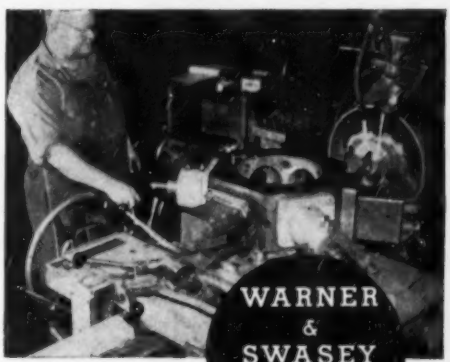
Reduced tooling cost and lower setup time make the Warner & Swasey saddle-type machines equipped with a Cross Sliding Hex Turret a simple and profitable solution to small lot chucking problems. Here is the easy way to handle large diameter work when difficult and accurate turning, facing and boring operations are involved. We can supply Standard Cross Sliding Hex Turret Tools including Special Taper Attachment which cut setup time to minutes. No tools need be changed, just minor adjustments are usually sufficient.

50% FASTER

At Electric Controller & Manufacturing Co., Cleveland

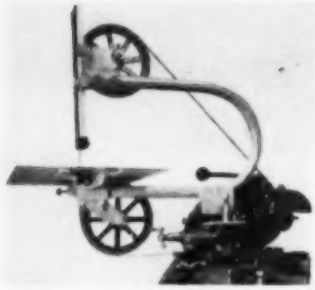
80% of the jobs here are in lots of 1 to 6 pieces. Parts are machined *after* the order is received. Production must be fast to make delivery dates. Electric Controller report they turn out parts 50% faster with their Warner & Swasey 3-A Cross Sliding Hex Turret Lathe. In the illustration carbide tooling is being used to machine a 17" x 7⅜" Meehanite brake casting within limits of .0005".

To learn if a Warner & Swasey Cross Sliding Hex Turret Lathe can fit into your production picture for a greater return on your investment, call your nearest Warner & Swasey Field Representative, or write Warner & Swasey, Cleveland 3, Ohio.



WARNER & SWASEY SELLS ONE THING—INCREASED PRODUCTION

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

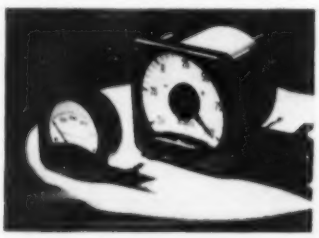


Bandsaw Attachment Operates On Lathes, Milling Machines

Materials 8 in. thick can be cut by this bandsaw attachment. Manufacturers recommend a blade speed of 200 fpm (95 rpm) for mild-steel cutting and 50 fpm (25 rpm) for tool steels or stainless steels. Blades with 18 to 20 teeth per in. are suggested for thin stock and 10 or 14 teeth per in. for heavy stock or soft material.

The steel worktable is 14 x 18 in. and can be tilted for miter cutting. Frame is extra-heavy steel pipe and blades are up to ¾ in. width and 80 in. long with brazed joints recommended. The attachment fits lathes with from 9- to 16-in. swing, and all milling machines. Shipping weight is 35 lb, and the price is $39 fob, Hoboken, N. J.

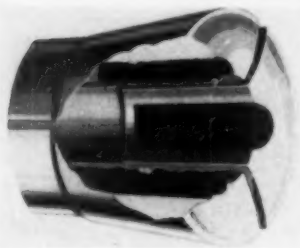
Alois Steiner Lathe Saw Attachment, 1014 Washington St., Hoboken, N. J.



Temperature-Indicator Line Includes High and Low Ranges

Cold-end compensated thermocouple thermometers for temperatures up to 3000 F and resistance thermometers for temperatures up to 300 F are included in this line. The thermocouple thermometer is available in two sizes: the DO-71, with a 3½-in. flange and the DW-71, with a 2½-in. flange. Both can be supplied in either square or round cases. These units are for industrial applications including melting pots, industrial furnaces, infra-red drying ovens, oil quenching baths, and salt baths for annealing. The resistance thermometers, for high accuracy at lower temperatures, are produced in two standard types; the DD-15 long-scale instruments and the DD-6 and DD-7 six-in. rectangular surface- and flush-mounted instruments.

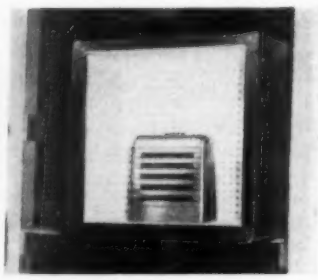
General Electric Co., 1 River Road, Schenectady 5, New York.



Worn Collets, Feed Fingers Get Tungsten-Carbide Inserts

Collets and feed fingers, normally worn over size, can be reclaimed and the precision of the parts restored by inserting carbide wear sections ground to collet dimensions. This reworking is said to be especially adapted to collets for high-speed automatic work where accuracy must be maintained with minimum down time. Annealing is eliminated, thus maintaining original hardness and temper. Round, square, hexagonal, or special-shaped collets can be reclaimed. It is only necessary to send collets for rework giving the hole size required.

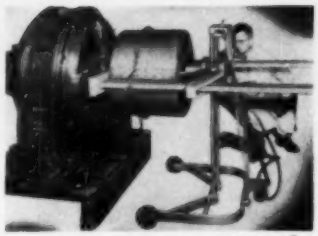
S & E Machine Products, Inc., Bridgeport, Mich.



Soundproof Booth Facilities Shop Use of Intercom Systems

By placing intercom stations in the Model M-15 sound booth, a high percentage of background shop noises are absorbed and not transmitted to stations in quiet areas. Of wooden construction, the booth is lined with acoustic insulation board, and is a 13½-in. cube. Price is $13.50.

Executone Inc., 415 Lexington Ave., New York 17, N. Y.



Hydraulic Pulley Puller Rated At 50-Ton Pulling Capacity

This heavy-duty portable pulley puller, for removing large pulleys, wheels, and gears from shafts, is actuated by a hydraulic jack. Crossbeam puller arms and feet are of special heat-treated alloy steel. Pressure exerted is regulated by a 3-speed hydraulic pump. Though weighing more than 600 lb, the puller is said to be easily handled by one man. Pulleys as large as 42-in. dia with face width up to 48 in., can be handled. Price is $595 fob factory.

Industrial Engineering Equipment Co., 122-124 E. Fourth St., Davenport, Iowa.

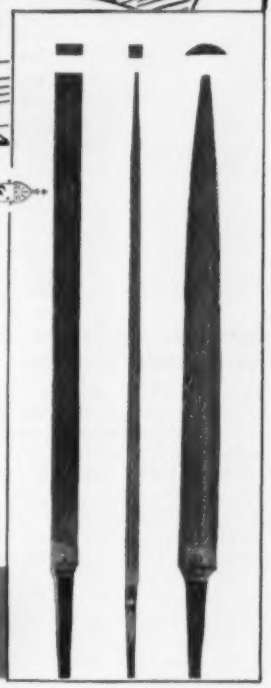
Simple Drillpress Workholder Operates on Pantograph Principle

Operating on the same principle as a pantograph drafting machine, the Torkarm attachment holds work securely while permitting the operator to move it freely across the work table. The "free-movement torque absorption" attained by this workholding attachment is due to the action of two pairs of arms hinged in parallel on fixed centers at both ends and in the middle. The hinging allows free lateral movement, and the fixed-center arrangement forces the arms to remain parallel. This assures that the plates cannot rotate. Thus it remains stationary under torque, but moves freely in the horizontal plane in any direction when lateral force is applied. The unit can be quickly clamped onto any drill-press or vertical tapper without use of a bracket or need of drilling a hole.

Torkarm Corp., 2908 Emerson Ave. So., Minneapolis, Minn.

POP'S school of Filing

AIN'T THAT JUST LIKE STOOP? HE SAYS THE FINS ON THAT DIE CASTING REMIND HIM OF THE ALPS! SO HE'S KNOCKIN' 'EM OFF WITH A SWISS PATTERN FILE!
SWISS PATTERNS ARE FINISHING FILES--WHICH IS WHAT STOOP WILL BE WHEN POP CATCHES HIM.
HE'LL GET THE POINT--RIGHT WHERE HE DON'T WANT IT!
STAN RANDALL



LIKE most production-wise foremen, Pop is a bug on tools. He knows that Nicholson X. F. (Extra Fine) Swiss Pattern Files, for example, are the finest finishing files you can buy. And heaven help the man who uses 'em on the wrong jobs!

Nicholson Swiss Pattern Files are widely used for removing burs left from previous machining operations, rounding out slots, smoothing small parts, and final finishing on all sorts of delicate and intricate pieces. They come in seven degrees of coarseness, scores of shapes and sizes. Available through your industrial distributor.

Send for the Nicholson booklets, **"Ten Special File Types"** and **"File Filosophy."** They're FREE.

NICHOLSON FILE CO. • 29 ACORN STREET, PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON ... *a file for every purpose*

Sterling Variable-Speed Motor Totally Enclosed, Fan Cooled

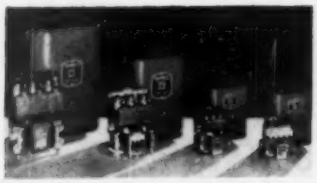
The Speed-Trol motor, available in the enclosed, fan-cooled design, embodies forced-draft ventilation by means of an external fan, protected by a streamlined fan cover. Infinite speed adjustment is provided through a large speed indicator on the motor or through mechanical, electrical, or lever-type controls. The motor is built integrally with pulleys, shafts, and belts in a compact unit for easy installation.

Sterling Electric Motors, Inc., Los Angeles, Calif.

Lightweight 7-In. Polisher Sports Spindle-Locking Pin

For intermittent service in small shops and garages the 7-in. Junior Polisher has a cast-aluminum housing and weighs 8 lb. The polisher is equipped with a spindle-locking pin for fast changing of bonnets and pads. Its reversible auxiliary side handle is for either right- or left-hand use. The side handle also has a trigger switch with switch-locking pin for continuous operation. No-load speed is 2000 rpm and standard voltages are 115 or 220 volts.

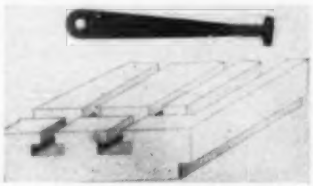
The Van Dorn Electric Tool Co., Towson 4, Md.



Motor Starters, Contactors Conform to Latest NEMA Standards

Sizes 0, 1, and 2 open contactors and starters are made with standardized mounting dimensions, and are designed to conform to latest NEMA standards for industrial control. Straight-line guided motion of the armature and movable contact assembly are provided. Double-brake silver-to-silver contacts are accessible for inspection and replacement without removing wiring. Only a screw driver is necessary to remove the coil.

Square D Co., Industrial Controller Div., 4041 N. Richards St., Milwaukee 12, Wis.



Dayton Rogers Offers Free Machine-Tool Slot Cleaner

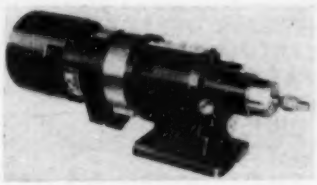
All-steel rust-proof machine-tool slot cleaner has an over-all length of 8 in. and is made from 0.125-in. strip steel. The tool is sent free upon request on company letterhead.

Dayton Rogers Mfg. Co., 2824 Thirteenth Ave., South, Minneapolis 7, Minn.

All-Aluminum Fittings Connect 3/16- to ½-In. Tubing

These aluminum fittings eliminate the galvanic action which ordinarily occurs when brass fittings are used with aluminum tubing. The body of the fitting contains a flaring cone and the nut contains a thrust collar. One turn of the nut with an ordinary wrench is sufficient to shear off the collar, and further tightening plants the collar onto the tube forming a leak-proof seal. Uniflare aluminum fittings are available in all standard shapes on a made-to-order basis for use with aluminum tubing 3/16- through ½-in. OD.

Scovill Mfg. Co., Waterbury 91, Conn.



Automatic Drilling Unit Has Full Hydraulic Control

Feeding pressure of the Model KH drilling unit is derived from hydraulically controlled centrifugal force. By external adjustments, the amount of rapid approach, rate of feed, and over-all length of stroke may be changed as desired, facilitating short- and long-run production of a variety of parts. The unit handles 1/32- to ¼-in. tools with standard collet chuck, depending on materials and drilling conditions. With special chuck it handles tools up to ⅜ in. in soft materials. Remote electrical controls are employed and the mechanism runs in oil with ball-bearing suspension.

The Gouvo-Nelson Co., 1935 Antoinette St., Detroit 8, Mich.

Planer Slide Rule Calculates Planing Times

For given return and cut speeds, length of stroke, width, and feed, the Gray planer-time calculator determines planing time. A chart on the reverse side of the calculator recommends cutting speed and feed for various materials. The calculator is designed only for planers equipped with modern variable voltage drives. Price is $2.

The G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio

Guard Against Atmospheric Hazards...

WITH

Century PROTECTED MOTORS

Drip Proof

Splash Proof

Totally Enclosed Fan Cooled

Explosion Proof

Century Motors

ALTERNATING CURRENT MOTORS

POLYPHASE

Squirrel Cage Induction — 1/6 to 400 H.P.
Wound Rotor Motors—1 to 400 H.P.
Synchronous Motors—20 to 150 H.P.

SINGLE PHASE

Split Phase Induction—1/6, 1/4, 1/3 H.P.
Capacitor—1/6 to 20 H.P.
Repulsion Start, Brush Lifting, Induction—1/2 to 20 H.P.

DIRECT CURRENT MOTORS

1/6 to 300 H.P.

GENERATORS

AC, .63 to 250 KVA
DC, .75 to 200 KW

GEAR MOTORS

1/8 to 1-1/2 H.P.

MOTOR GENERATOR SETS

AC to DC, AC to AC
DC to DC, DC to AC

Open Protected, Splash Proof, Totally Enclosed Fan Cooled, Explosion Proof.

Ball Bearing motors are factory lubricated for several years' normal service. Bearing housing construction permits easy re-lubrication when unusual service demands it.

CE-673

To guard your production against the destructive effects of atmospheric hazards, Century offers four types of protective motor frames.

DRIP PROOF—meets the requirements of most installations. Use it where operating conditions are relatively clean and dry. Top half of the frame is enclosed to keep out falling solids and dripping liquids.

SPLASH PROOF—keeps splashing liquids out of the motor even when the frame is washed with the full force of a hose. Use Century Splash Proof motors indoors or outdoors.

TOTALLY ENCLOSED FAN COOLED—resists the hazards of abnormal concentrations of dusts, powders, grit, oil mists, acid and alkali fumes.

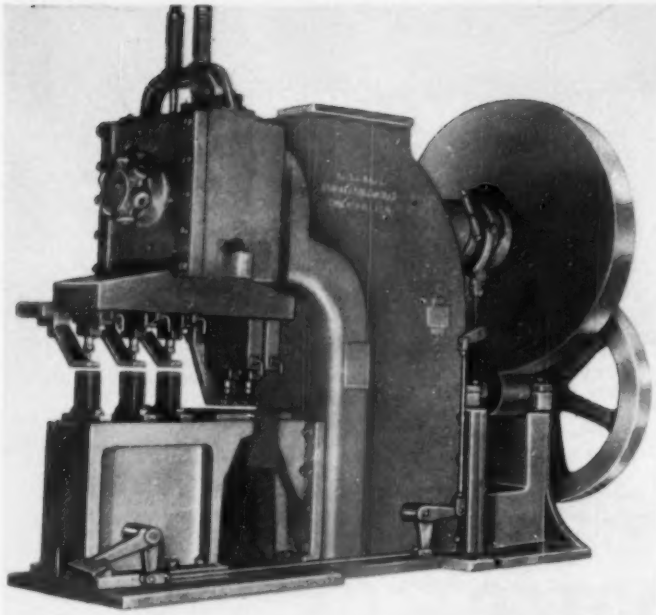
EXPLOSION PROOF—protects life and property in atmospheres charged with explosive dusts or vapors.

The properly selected protection with the wide variation of starting torque characteristics to choose from provides long operating life and improves the production of the driven equipment.

Century motors are available in a wide range of kinds and types—in sizes from ½ to 400 horsepower—for single phase, polyphase and direct current applications.

Specify Century motors for all your electric power requirements.

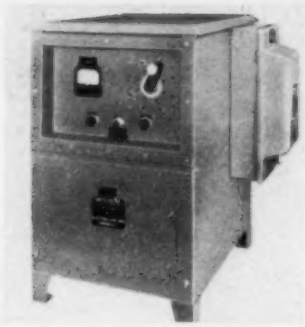
CENTURY ELECTRIC CO. 1806 Pine St. • St. Louis 3, Mo.
Offices and Stock Points in Principal Cities



Kling Universal Punch Has 235-Ton Ram Pressure

For use in structural steel and fabricating shops, the No. 12 universal punch has rated ram pressure of 235 tons, a 2¼-in. stroke, and a throat depth of 28½ in. It can punch a 2½-in. hole through 1¼-in. mild steel. The punch comes equipped with two low die holders, three high die holders, and two gooseneck die holders, as well as the necessary punching equipment for the die holders. It can handle 3-in. I-beams to 36-in. H-beams and is capable of a broad range of flange punching without the necessity of changing setups. Flange and web punching can also be done without making any changes in the setup.

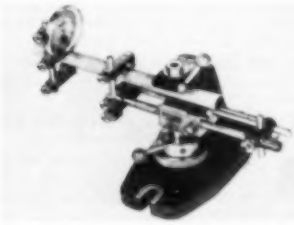
Kling Bros. Engineering Works, 1300 No. Kostner Ave., Chicago 51, Ill.



Heating System Preheats, Stress Relieves, Welded Pieces

Operated in conjunction with a 40 kva Model RTA regulating unit, the Model AC3 low-frequency induction-heating unit, by the Smith-Dolan system, is for preheating before welding and stress relieving after welding. The AC3 heating unit is 35 in. wide, 32 in. deep, 46⅛ in. high, and weighs approximately 815 lb. The regulating unit is 20¼ in. wide, 31 in. deep, 29¾ in. high, and weighs 620 lb. The combination is designed for use where extreme flexibility is not needed. The regulating unit is arranged for operation on 220, 440, and 550 volts, at commercial frequencies.

Electric Arc Inc., 152-162 Jelliff Ave., Newark 8, N. J.

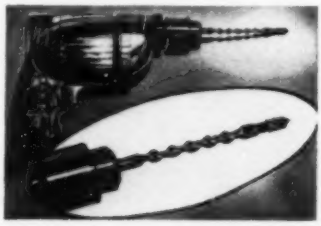


Drilling Attachment Simplifies Close-Tolerance Work

Universal drilling tool, the "Reglus", is to simplify the drilling of round, flat, square, or hexagonal workpieces within an accuracy of 0.0003 in. With accessories, it facilitates drilling holes at predetermined intervals, adjacent holes for making slots, holes at any radial angle, and holes in balls. It is an automatically centering unit. Primarily for drilling, it is also an angle comparator on two planes, and serves as a depth gage and center-distance comparator on round, square, or hexagonal stock.

The "Reglus" tool holds workpieces up to 1¾-in. dia, and accommodates cylindrical drill bushings with holes up to and including 15/32-in. dia. Accessories include a V-mount for holding pieces from 3/32- to 11/32-in. dia, a cone mount for drilling balls up to 1⅜-in. dia, a modified mount for drilling flat and eccentric pieces, and a clamp, attached to a dial gravity pointer.

Cosa Corp., 681 Chrysler Bldg., New York 17, N. Y.



Combination Bit and Saw Fits High-Speed Drills, Drillpresses

The Miller rotary high-speed copesaw drill bit fits any standard electric drill or drillpress and is designed to drill its own starting hole. The upper part of the bit is used to cut, saw, or ream the center of circles or other designs in light metal, brass, copper, aluminum, wood, plastic, and similar materials. To operate, a hole is drilled with the end of the bit, the operator follows through to the cutting section of the bit, and applies slight pressure against work material following the line of mark to cut out.

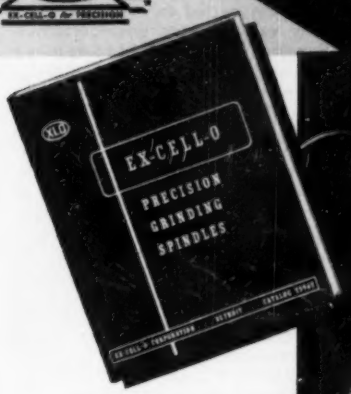
International Twist Drill Corp., 7th & Wyandotte, Kansas City, Mo.

PRECISION GRINDING ELIMINATES SCRAPING

Ex-Cell-O Spindle Finishes Dovetail Ways in 1/10 the Time Formerly Required

Actual case histories show that slide ways now being precision ground in 15 minutes formerly required 2½ to 3 hours of hand scraping to obtain satisfactory bearing. Slightly larger slides that are now precision ground in 20 minutes formerly required 3 to 4 hours of hand scraping.

Ex-Cell-O spindle engineers have a wealth of experience in designing precision spindles to meet special applications. If you don't find a spindle to suit your needs in the spindle catalog, write to Ex-Cell-O stating the operation to be performed and your requirements in terms of speed, horsepower and preferred driving method. A simple sketch showing some basic dimensions is helpful, too.



If you would like an Ex-Cell-O Precision Grinding Spindle Catalog without obligation, just write on your company letterhead, asking for Catalog Number 25962.

50-22

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

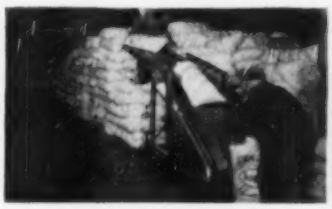
FOUR WAYS

to get results

in faster, lower-cost handling

1 WITH ROLLER AND BELT CONVEYORS

— keep cases, cartons, packages, parts moving — better, faster, cheaper — on Standard gravity or power roller or belt conveyors. We plan and build efficient equipment for any handling need — designed to fit your particular needs — cut your handling cost.



2 with a HANDIPILER

— a portable self-contained conveyor unit. Stacks up to 17 ft. — handles up to 135 lbs. packages — saves time and manpower in storage and shipping rooms.

3 with an INCLINEBELT

— lifts and lowers packages from floor to floor continuously and automatically. Available to meet elevations 8 ft. to 14½ ft. inclusive; handles commodities up to 25½ inches wide.

4 with PNEUMATIC TUBE SYSTEMS

— provide swift, sure, safe transportation of messages, documents, blueprints, samples, small parts, money; cylindrical or oval tubes 1½ inch upward with dispatching and receiving terminals for complete systems to meet your needs. Write for special bulletin SPT.

Write for Standard's general Catalog AM-50. Tell us what you want to handle or name equipment on which you want more information.

STANDARD CONVEYOR COMPANY
North St. Paul 9, Minn.
Sales and Service in Principal Cities

ROUND TABLE *Discussion*

THE FIFTH WHEEL

As a man who has been through a similar deal it makes me wonder what Al will say two months from now. Now he is worried because Stebbins is coming in to rob him of some of his responsibility.

At present all that Al has to do is to see that the men arrive on time and are working, see about production and keep it up to the proper level, order new material and see that the finished parts are moved out of the way, take care of the beefs and gripes of the men, see that the tools are in good shape and producing up to the standard, see that the tools for the new job are in shape and ready to go into production, and a thousand and one other problems that plague a foreman.

Also, when a man tells him that a certain tool does not produce up to the standard, he has to drop everything and see what is wrong. If the tool is at fault he has to report it to the front office and then chaperone it to the repair department and try to get them started on it. (Sometimes they can be very uncooperative.) Sometimes the brass hats try to prove to him that he can keep a tool going for a while longer. Also he has to watch that a disgruntled operator is not trying to kill the job.

If a man such as Stebbins is put in with the necessary authority he will have the ability to put a tool out of commission without putting Al behind the eight ball on production as the delay will be charged to him and he will be responsible. Also Stebbins will have all the leg work to do. Al will not have to keep chasing into the repair department to see if they are working on his tool.

Stebbins will have to go into each department as the man who is to absorb all the grief of tool repairs. The office will have to charge him and not the department for the delay due to tool repairs.

However Stebbins can go into a department with the air of one who is hunting for something to do to plague the foreman and show his authority. If he does there will be the very dickens to pay. The office and Stebbins should be responsible for making the deal work. In that case Al will not lose any of his authority or responsibility. Instead he will lose one of his worst headaches.

During the first World War I had

How many new ways ARE there to cut costs?

THERE IS ONE WAY TO FIND OUT IN A HURRY

Plan—

right now to attend the

1950 INDUSTRIAL *Cost-Cutting* EXPOSITION

APRIL 10th-14th (inclusive)

CONVENTION HALL
Philadelphia, Pa.

Hundreds of exhibits comprising new developments in practically every kind of equipment—machines, tools, accessories, materials handling, gages, etc., etc. The most comprehensive exposition of its kind ever held.

Write or fill in the coupon and mail today for your advance registration form.

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New Adjustable Boring Bar Blades
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New Twist Drills
See These Tools at The ASTE Show
SUPER TOOL COMPANY
21650 HOOVER ROAD
DETROIT 13, MICHIGAN

trouble getting tools and material for some priority production that I was handling. I had to go to the superintendent and report. The man who was holding out would be called on the phone and he would report that everything was all right. At first the superintendent took the attitude that I was just complaining but when the evidence started to pile up a man was appointed as "expediter." I was told to report to him if there were any more delays.

A day or two later there was another delay and I made my report and waited. A few hours later a tray of the much-needed material was handed me and I was told more would be coming as I needed it. I later found out that the foreman in question did not show any intention of cooperating when the expediter approached him so he was told to pick up his belongings and get going while he could. The expediter had power to act and got results.

If Stebbins is given the authority he will have the power to get repairs done that would take a lot of Al's time to get out. Also delays will be charged to him and not to Al. Sometimes Al will find that it is a full-time job to get his tools through the repair department. He can hand that job to Stebbins and find that he has more time for production.

It will be up to Stebbins, with the office back of him, to make the deal work. And when he does make it work, Al will love him.

Chas. O Rankin
Ontario, Calif.

•

The foreman's responsibilities in a shop consisting of three men are the same as those in a plant with 300 or 3000. The only difference is the volume of detail work. Both are responsible for the production and expenses of the department. In the large plant, it is physically impossible for one man to handle all the details, so the foreman has assistance in routine matters. He is not relieved of any of his responsibilities, simply because other men are performing the tasks assigned to him.

If the inspector is delegated to inspect the tools and equipment of a department, the foreman should appreciate the company's gesture to assist him in his duties. By cooperating with the inspector, the foreman can improve the quality of production as well as lower the costs of production which is his responsibility. In many cases obsolete tools will be dicarded and more efficient methods introduced.

At one of the plants where I was in charge of the maintenance of tools

of the Brass Rod Industry

the standard of comparison!

There is a difference in brass rod—A BIG DIFFERENCE.

Some mill men say there is no difference in FREE CUTTING Brass Rod made by different Brass Mills. They reason that since all mills use the same class of raw materials, the same type of equipment, and in addition, since all are controlled by well-equipped laboratories and technical departments, the product must be the same.

However, the men who actually operate the machines at rod consuming shops, who buy rod from more than one mill and who are really in a position to make true comparisons say, "THERE IS A DECIDED DIFFERENCE." Many of these consumers operate their machines on the same parts for long periods, and gradually the product of one particular mill BECOMES THE STANDARD OF COMPARISON for BRASS ROD of all mills.

Mueller Brass Co. Red Tip FREE CUTTING Brass Rod is the yardstick with many of the largest rod consumers, and since it enjoys this rating, it is usually selected for the tough jobs.

We have the "know-how" to produce the best in Brass Rod for any purpose. If you want it for long runs where special properties are required, our Technical and Metallurgical engineers are at your disposal. Worthwhile savings can be made.

Millions of pounds of brass rod are manufactured in our mill each month. Shipment can be made at once from our large factory stocks.

YOU CAN PIN MORE PROFIT TO YOUR COST SHEETS!

Mueller Brass Co. Red Tip Brass Rod is a universal, many-purpose, extra-fast cutting Rod. Its constant uniformity saves tools, grinding and setup time. It actually can be machined at greater speeds than that of which any machine is capable on a continuous production basis.

YOU CAN PIN MORE PROFIT TO YOUR COST SHEET BY USING MUELLER BRASS CO. RED TIP.

MUELLER BRASS CO.

PORT HURON • MICHIGAN

STREAMLINE PRODUCTS

toughen metal

improve surface

end stock waste

with

TORRINGTON SWAGERS

The Torrington Rotary Swaging Machine delivers 4000 hammer blows a minute...reduces, sizes, rounds, points and tapers rod, wire and tubing . . . work-hardens metal for toughness and resilience...produces a burnished surface . . . utilizes every bit of stock.

Torrington Swager performance is based on our 42 years of swaging experience. Send the coupon for your free copy of the booklet illustrating the machines and describing the art of rotary swaging.

THE TORRINGTON COMPANY
Swager Department
559 Field Street • Torrington, Conn.

For a free copy of this booklet, send the coupon today.

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Name_____

Firm_____

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and equipment, the foreman would blow his top everytime I issued an order to shut down one of the machines for repairs. His contention was that as long as the machine was producing, let it run. If my department was under his direction, these machines would become obsolete and scrapped in a very short time. Since my department was independent of the production department, we prevented serious breakdowns. My men constantly inspected the tools before and after every production run. If a pair of dies did not meet specifications or presented a reasonable doubt regarding their condition, they would not be released, even if it held up an important job. In the changing of dies, more than three hours were required. We couldn't afford to hold up a machine for this length of time unless we knew the tools going in would last long enough to give a reasonable production run. If the foreman had his way, he would probably have us install cracked or chipped dies, hoping to get some production before they became useless.

During the war, at another plant, turret lathes were set up to ream the cavity of a shell, face the bottom, cut the band groove, and knurl the groove. This sequence worked out for a while but suddenly the shells wouldn't pass inspection. The foreman blamed the machines and wanted new ones set up. We checked the machines and found that the pressure of the knurling rolls pushed the chuck jaws out of concentricity. We suggested supporting the shell with the tailstock during knurling, but one of the inspectors called our attention to the method used in another department on a different size shell. A separate operation was used on a special knurling machine. We set up one of the turrets to do just that operation until we received our knurling machine. Production on this job was improved both in quantity and quality.

A production supervisor with a rush order in his hand will overlook the condition of the equipment as long as it is capable of turning out his work. Many times the operator's safety is also secondary to producing a special job. The "fifth wheel" in many cases acts as the foreman's conscience (if he has one) or as a second thought.

Frank J. Zarnowski
Rutherford, N. J.

•

I'm afraid that the so-called "Fifth Wheel" will be inclined to deflect rather than to keep the old wagon of smooth production in line if it is used as a separate unit. The idea

GRAY-MILLS

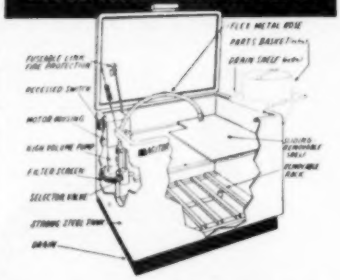
PUMPS and COOLANT SYSTEMS

SAVE ON PRODUCTION COSTS

Tools last longer, cut better when Graymills Coolant Systems are used. Units available for all types of machine tools. Capacities 1 to 70 g.p.m. 1/30 to ½ HP. Up to 80 psi. Tank sizes 1 to 38 gallons. Prices as low as $41.50 for complete unit. See your distributor or send for literature.

GRAY-MILLS AGITOR CLEANING UNITS

FOR THE TOOL ROOM, PRODUCTION, PLANT MAINTENANCE and REPAIR and SERVICE DEPTS.

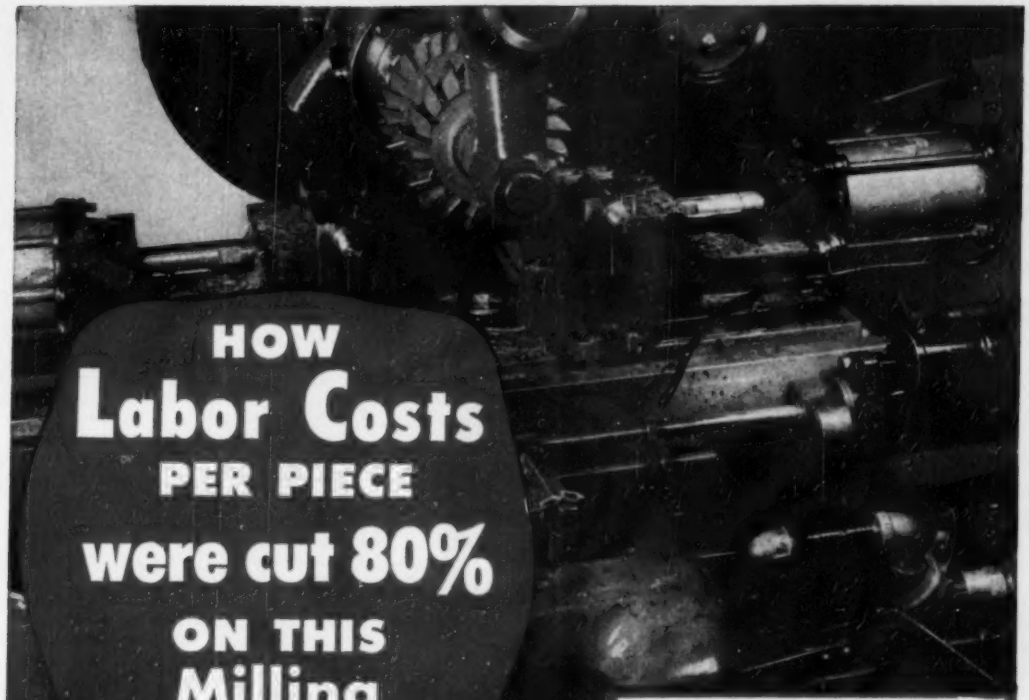


Graymills New improved Agitor Cleaning units provide a safe, clean time-saving way to remove oil, grease, chips and grime from metal parts. Usually "cold" petroleum solvents, or solvent emulsion cleaners, are used.

3 Way Action. 1. High volume pump discharges solvent through hose, flushing holes, slots, etc. Clean dies this way; also parts before repair. 2. Entire tank agitates while parts soak. 3. Solvent discharged fountain-like for flushing castings, etc.

WRITE FOR LITERATURE

GRAYMILLS CORPORATION
Evanston, Ill.



HOW Labor Costs PER PIECE were cut 80% ON THIS Milling Operation

THE cost of milling an anchor pin in this midwestern plant was running too high. The part was hand clamped and hand milled—one end at a time on a standard hand milling machine.

A Bellows Field Engineer suggested that the operation could be made simple and inexpensive with Bellows "Controlled-Air-Power" Devices.

A continuous action Bellows Air Motor was installed to traverse the table. Two Bellows Hydro-Checks served to control the table movement, assuring positive smoothness of feed and eliminating any back lash or chatter.

Bellows Air Vises were mounted on both ends of the table and were linked to the bed to open and close automatically.

As the unit now operates the operator loads one vise while the other is under the cutter. Once the unit is started all operations except loading and unloading are continuous and automatic.

The result: *Labor costs per piece were cut 80%; production jumped from 75 pieces per hour to over 400; cutter life was increased 600%.*

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has its merits but do they offset the excessive cost and the potential friction that is likely to occur with its use? While it may be the means of relieving the foreman of a certain amount of annoying details, it has its disadvantage in rubbing the poor guy's hair the wrong way. The idea of having a suitable man devote his time to periodic inspection of equipment is all very well but why have him report to anyone else but the foreman in charge of the department? Such an arrangement savors too much of fault finding—an effort, so to speak, to discredit the head in charge by digging up petty faults.

Let us assume that such a "wheel" was a good thing; is that inspector going to be easy to get? A person of such caliber as to be able to expertly detect irregularities in machinery, tools, dies, jigs, and so forth certainly couldn't be had for any mediocre pay. You couldn't put any Henry Dub on a job like that as he would stir up more trouble than already exists. Again, could any "four-star" worker receive the cooperation so necessary to make his efforts worth while? One of the most necessary things in effective operation is cooperation—without it he loses much of his power. Would he have the men behind him? I doubt it.

Workers usually have a lot of respect for their foremen—assuming, of course, that the shop head is of the right type. I am inclined to think that they would consider it an offense to have an outsider checking up around the shop. The worker may be aware of some irregularity in the machine he is working on and hesitates none in getting the information over to the foreman. Why not have the trouble-shooter make periodic check ups on the men and report to the head office what he has found! Might just as well strike a match to a keg of black powder. No, let's eliminate that fifth wheel and let the old wagon go in a straight line.

Jack Everett
San Francisco, Calif.

•

THE FIFTH WHEEL

During the war our firm decided to put into operation a quality-control department. As a result the foremen found an inspector in each department whose duty it was to inspect pieces in process both visually and dimensionally. Both foremen and the workers were informed in advance of the purpose of the quality control and how it would function.

However some of the foremen did not like the idea, as they had no

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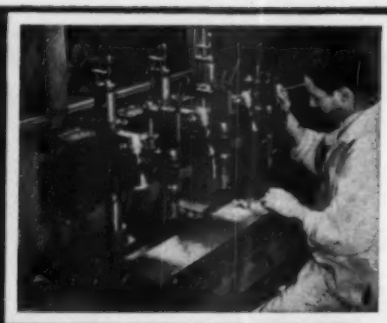

Note in the photo above how the tables butt to form a continuous work surface when machines are installed in batteries.

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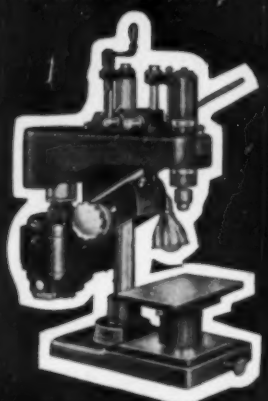
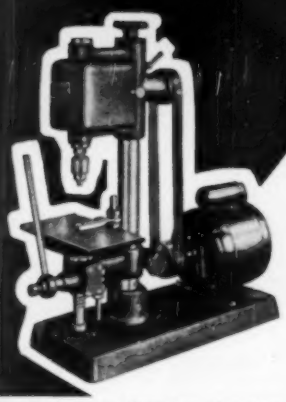
YOU CAN SOLVE YOUR SMALL HOLE PROBLEM

If your job includes the drilling and tapping of small holes, with surgical precision and on tight production schedules, the two Hamilton precision tools shown here were built to meet your special need. They excel in fast, precision drilling and tapping of small holes in materials as diverse as paper and monel or ceramic and bronze. *And more* their flexibility, sensitivity, and stamina far exceeds the requirements of the average user.



Hamilton Varimatic, Super-Sensitive Drilling Machine. Infinitely variable speeds from 840 to 9300 R. P. M. Drills holes from .004" to 5/16".



Hamilton Super-Sensitive Tapping Machine. Patented power transmission. Tap idles in reverse and automatically changes direction of rotation when pressure is applied to feed lever. Released pressure again reverses spindle, reduces speed to "idle" and withdraws tap. Capacity from the smallest and finest tap to 10–32 inclusive.

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THE Hamilton TOOL COMPANY

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authority over this inspector and they thought that an inspection in the department should come under their supervision. The works manager wanted a separate impartial quality-control unit with the idea it would be of great benefit to all operations. This control did put a double check on all operations, and when checker and operator did not agree on size the foreman was called for a third check and usually was able to straighten out the difference of opinion on size.

The quality-control supervisor has the authority on the rejection or passing of work when there is a question of quality. In case the foreman is not within call, the supervisor of quality suggests to the operator to hold everything until foreman arrived to decide the corrective measures. In no case do the inspectors tell the foreman or the employees how to do the job or how to correct a fault. It is also quality control's job to check all gages and measuring instruments and keep them in good condition. The foreman is still responsible for the quality of work leaving his department and this inspection by no means relieves the operators of their responsibility. By a general admission that we can all be wrong and that we all make mistakes, we soon found we could and did lower the line of expected rejections to a fraction of previous years. By catching the rejections at the place they occurred we saved subsequent operations on work that would not have passed the final inspection. A desire on the part of foremen and quality-control supervisor to be thoughtful of the other fellows' feelings and a careful consideration of faults, we soon found these on-the-spot inspectors would soon spot bad work either at the source or very soon after.

At the end of one year we had cut rejections to less than half. We had no added cost, as all work not up to expected quality was found before it reached final inspection, therefore we did not need as many employees in final.

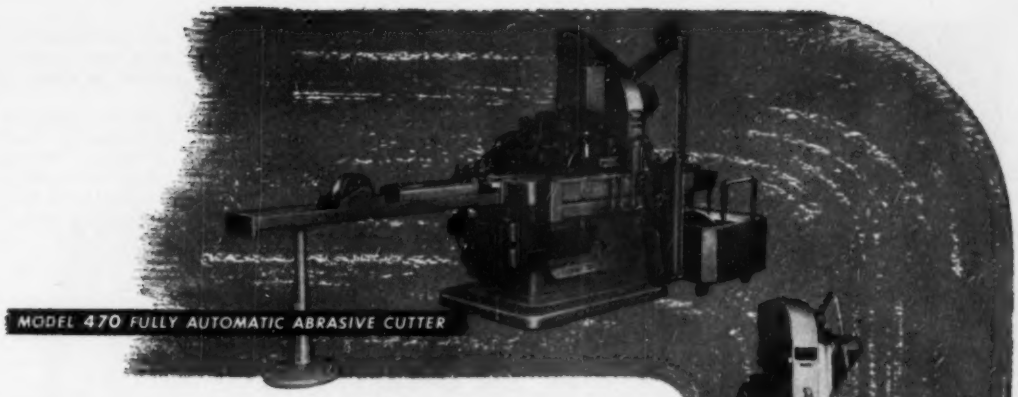
A. E. Salmons
Philadelphia, Pa.

•

BLOWING OFF STEAM

It is not to be expected that a foreman should know all the answers, as new and puzzling problems come up for him to solve. He naturally goes for information where he thinks he can most easily find it.

It is not good policy for him to advertise his problems in the shop, or outside either. However there is



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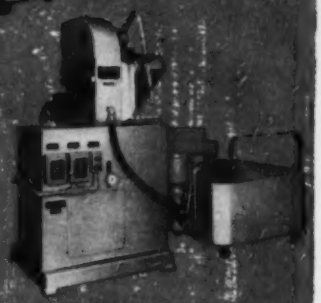
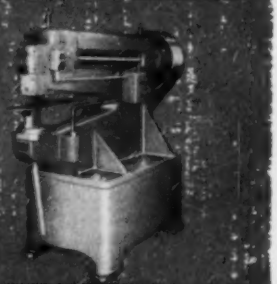


MODEL 223 ABRASIVE CUTTER

MODEL 15 ABRASIVE CUTTER



MODEL 530 NIBBLING MACHINE

ABRASIVE CUTTING Annealed or unannealed steel of any analysis, brass, bronze, monel, ceramics, phenol plastics, glass, tungsten, tantalum carbide—these and many other materials can be cut abrasively, in many cases cheaper and better than by any other method.

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Series 6500
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Two years ago we introduced the original E-CON-O-MILL, the cone-type face mill, that saves on *grinding costs*, cuts down *tool inventory*, and reduces *machine down-time*.

Now we present this new E-CON-O-MILL, with all the economy features of the original, *plus* a greater number of blades.

Cutter bodies are of the cone type, and are made in diameters of 8, 10, 12, and 14 inches. They support the blades full length in accurately machined slots.

Blades of ½ by ⅜ tool bit type are tapered two ways, and tungsten carbide tipped. They come finish ground, and may be sharpened individually with the aid of the same combination grinding fixture and checking gage used for the original E-CON-O-MILLS. They are quickly inserted without removing the cutter from the machine. The same blades serve all sizes of Series 6500 cutters.

Available in three types: to cut steel, cast iron, and non-ferrous materials, each type with the proper carbide, and the tips ground to the correct radial and axial rakes.

Locks (the same as used in the original E-CON-O-MILL) are assembled in one piece, and remain attached when blades are removed.

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GAIRING TOOLS

no good reason why he should not feel free to call upon anyone whom he thinks can and will be ready to help him.

The fact that he has someone working under him who is trustworthy, and he has reason to believe can help him on his problem which is confronting him, should not hold him back from seeking the needed information. In fact it should be a good thing to do for both the foreman and the workman.

From the workman's standpoint, he should be pleased to know that his foreman has sufficient confidence in him to consult him and this would be an encouragement to him to make use of the suggestion box plan which has been found by so many firms and is being used more and more as time goes on and found profitable for both the employer and employee.

I happen to know of a firm where the general foreman, a subforeman, a draftsman and a machinist made a three-day trip to the mountains something over a hundred miles away, using the machinist's car, taking turns in driving, as well as anything else that required exertion on the trip. Expenses were equally shared. I presume that there were a few others in that shop who might have done the same thing, but not many, as people who can do such things agreeably are usually a small percentage of the whole, and are only mentioned here as a case where none was related to another but rather as an exceptional group always ready to share with others.

John Mark May
Watervliet, N. Y.

•

Most foremen have a soft shoulder in the shop where they can cry the blues or blow off steam. They have a trust in this fellow worker and hope that the steam evaporates at this point and doesn't carry over to do any damage. Some supervisors blow off steam in another department to prevent a flashback.

One foreman I knew would use the engineering department for a crying towel or gripe barrel. Everytime he had a load on his chest, he would collar one of the draftsmen and voice his opinions, objections, or criticisms. In this manner he unloaded a burden without fear of potential trouble and returned to the shop a better man to work with.

Many foremen do not have the art of blowing off steam like a gentleman and get into a great deal of trouble by saying things in a rage that they would not normally say. If they happen to "sail into" a certain

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Write for Bulletin No. 127

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25PB applies 15-ton pressure on weld in tube flaring test.

Pressure from 25PB flattens tube between plates in welding test.

WORKER FATIGUE PROBLEM SOLVED

Exacting tests of tube welds performed every 15 minutes during a tube mill run are no longer man-killing jobs at Shenango Tube Co., Sharon, Pa.

Now, Dake 25PB performs both flaring and flattening tests, relieving workers of fatiguing hand testing, cutting testing time 88%.

When not in use on tube testing, press serves plant in general shop and maintenance work. Another example of the versatility of Dake Presses.

WRITE FOR BULLETIN ON THIS TIME-SAVING OPERATION

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worker in front of the other men, the person would lose his respect for his foreman. The other workers will catch every word and repeat them to others, although the foreman doesn't remember saying them. In his blast he might condemn the management, a new system, or the men in general. Coming from a superior, it will carry much weight with the men and can do material harm.

Every foreman should have a faithful assistant to act as a condenser, whenever he has to let off some steam. This assistant should be a good listener, agree with the foreman's opinions, and forget the whole thing when he walks away.

The foreman who carries his troubles home is not a good companion to his wife or children. Eventually he may develop ulcers and become eligible for the superintendent's job.

Frank J. Zarnowski
Rutherford, N.J.

•

BLOWING OFF STEAM

"THE MAN worth while is the man who can smile when everything goes dead wrong."

This time Ed is wrong.

There are men of great executive ability who never get rattled or even ruffled, no matter how adverse conditions may be.

As an example, a former president of a good-sized corporation showed no sign of being irritated deeply when two workmen burst into his office and excitedly yelled "Mr. J., this office building is on fire and it is coming this way."

He, in apparent calm, said, "Call the fire department by all means," and then he smiled and replied "Please don't holler so loudly."

His next move was to gather up his incoming mail, walk to another building across the street where he watched the volunteer firemen at their work until he observed that there were not sufficient men to cope with the situation. So he walked out, put on a rubber coat and helped extinguish the blaze in his company's office building.

Such men are born to be serene under all conditions.

A foreman, to be a real one, should be above petty and small annoyances and be ready to overcome any problem without becoming hot in the collar.

Ed should be such a man.

In the position of a superintendent or a foreman, it seems very unwise for either of them to knock one employee to another.

This, in itself, is foolhardy, for, no matter who the employee is, the grapevine telegraph is always active,

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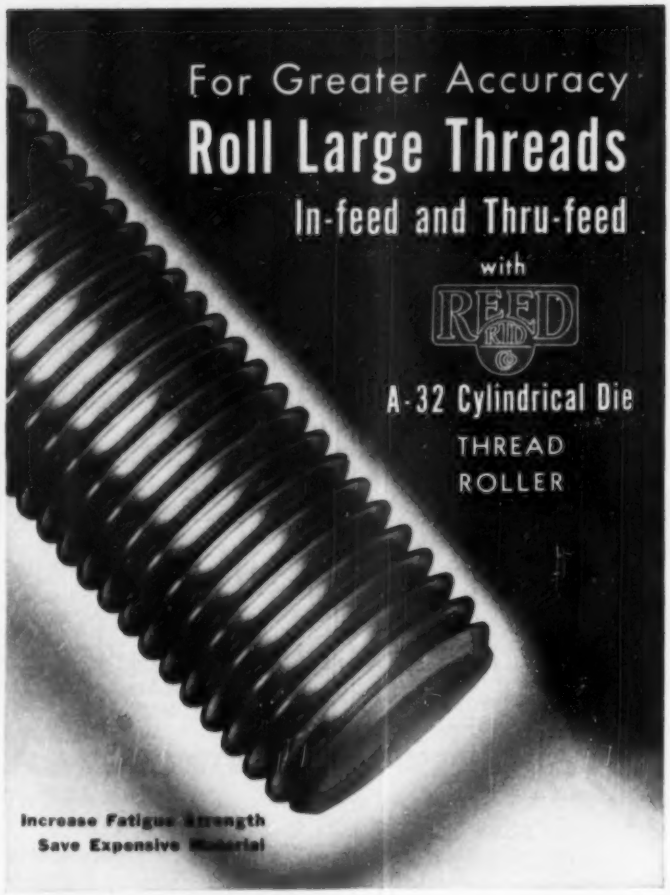

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and, sooner or later, adverse remarks to one man against another, who may work under his direction, will reach the subject who is talked about.

There was a foreman who was a very quick-tempered character but who never lost patience with an apprentice. He knew his trade very well and had the faculty necessary to instruct others in the work. In the shop was one of the thickest-headed apprentices ever to attempt to learn the machinist's trade. He seemed to know little and to learn nothing.

The foreman turned him over to a good mechanic who was to be his leader. After several weeks, the mechanic complained about the boy's lack of ability. Then the boy began to work directly under the foreman and did so for two months. Then the foreman had a heart-to-heart talk with the boy and advised him to try some other occupation, but the boy said that he had come there to learn the machininst's trade and he was going to do it.

The foreman supplied the boy with several books about trade and machine work and from that time on, the boy began to improve. In fact he went ahead rapidly because he was a student rather than a grubber and the books were his salvation.

Where is he today? He is superintendent in another plant and is respected by all of his men.

He never blows off; he confers with his superiors but does so rarely with those under his direction. However, he discusses with them their daily shop problems and occasionally, if asked, he talks over with them their personal matters and he has been found to be a good advisor.

There are many men who are occupying the positions of foremen who are not qualified for such places and, many times, they are the flies in the ointment.

F. H. Stebbins
Worcester, N. Y.

•

Ed certainly left himself wide open for future trouble. Maybe it will never happen. Perhaps that is why he is so sure it never will, since up to this point nothing has ever come from his blowing off steam to his workers. Sometimes, however, as Al says, there will come a time when down around the head of Ed will tumble the world.

On the whole, the hourly employee likes to have something on the boss, for then in his own mind, he is more secure and the boss can't ride roughshod over him. Also employees like to know more than some other per-

"No more rancidity, No more wheel loading troubles

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says this machine shop Foreman

"With each of the soluble oils we used previously, we had a serious problem in the operation of this grinder," says this machine shop Foreman. "The emulsion became rancid so quickly that we had to clean the circulating system and replace the entire charge frequently."

"Although the situation is aggravated by intermittent operation—the emulsion stands idle for long periods of time—we have been able to eliminate this problem entirely by simply switching to Gulf Soluble Cutting Oil. Then too, we have noticed that our grinding wheels cut cleaner with Gulf Soluble Cutting Oil—they don't load up nearly so fast."

Experiences like this with Gulf Soluble Cutting Oil make it the preferred cutting fluid in scores of machine shops. Here are a few of the reasons why it does such an outstanding job: It emulsifies readily with all but the hardest water, forms a stable emulsion, and contains an effective rust inhibitor.

For further information on Gulf Soluble Cutting Oil —and for one of Gulf's practical slide-rule-type calculators which will help you maintain desirable soluble oil concentrations—send the coupon below.

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Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off—by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

F-24

son and frequently will use some remark which has been passed on by the supervisor in a moment of anger or weakness and which can cost the boss his job if someone wants to go that far.

No supervisor should ever allow himself to be taken in so completely by a subordinate that he feels he can just unload his whole life history to him. For if he does he soon finds that this friend has him over the barrel and is demanding certain favors. The issuing of favors to one or two employees is a potential suicide. Other workers not in the favored group gang up and cause disaster to the foreman in many ways. Sometimes it is not open warfare, but hidden and the foreman just can't understand why he doesn't get ahead in the company. Too frequently members of the working class have powers that the foreman can not buck unless he is playing the game straight and makes no false moves.

Probably foremanship is the hardest spot for an individual, as usually the person has been in the ranks of the working class and has been picked by industry because of some outstanding talent or know-how. Usually the new foreman is left to his own devices and is at a loss to know how to act. Too often a company fails to help a foreman get set in his job and thereby loses much of the man's ability.

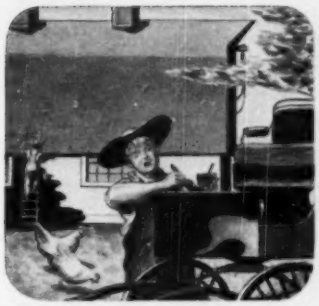
Because he has worked with these men as a co-worker, he drops into the habit of talking with them about many things. He will blow off steam about anything that may be bothering him to his once-worker-friends who are without doubt now jealous of his good fortune. For most of us feel that we are as good as the next fellow and should get as many breaks. This is human nature and it doesn't vary from generation to generation. However, as this newly made foreman spills his likes and dislikes to the men who are under him, soon they begin taking advantages and the foreman is lost. The company just checks him off as a misfit even if they were at fault in not properly educating him in foremanship.

There are two morals to be drawn from this tale. The first is—do not ever allow yourself to become dependent upon subordinates to blow off steam to. If you have the temperament, and many of us do, to talk when things go wrong, then at least pick a listener who is in the same job level and in the same company. Don't talk outside about company troubles and only talk to your best and most trusted friend.

The other lesson is for industry. When a company picks new foremen from the ranks, they must train them to become good foremen.

The job of foremanship and the position of a foreman are the most important phases of all management. For without foremen and good human relationships between foremen and labor most companies can not succeed in becoming great. A foreman is the link between management and labor. If it is a weak link—then like a link in a chain—it may snap and let the load down. If a foreman fails, the company loss is great and frequently the company fails to recover properly.

"He makes all the half-scale drawings."



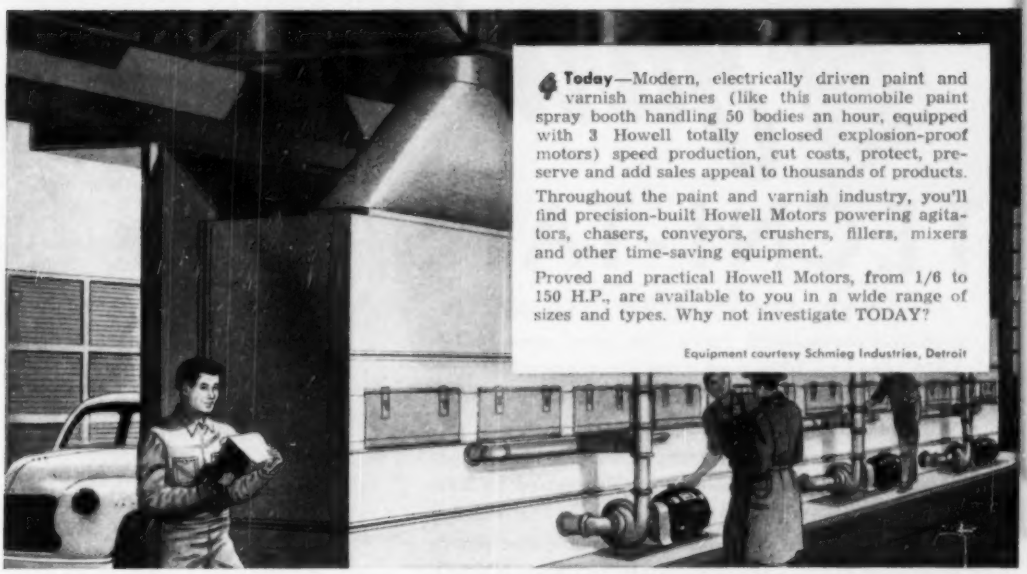
1 **1875**—For centuries, hard labor and a paintbrush were man's main means of adding beauty and color. But, with the industrial revolution at hand, new devices were sorely needed to break this bottleneck.

2 **1900**—The artist's airbrush was born. On its heels came the paint spray gun. Both products, strangely enough, stemmed from the atomizer used by doctors to prevent colds. Painting swung into high gear.

3 **1915**—Portable paint-spraying equipment was introduced in this, the year Howell "Red Band" Electric Motors arrived. Soon these rugged motors made important contributions to this and other industries.

PAINT . . . protects, preserves, decorates and sells!

(AND HOWELL MOTORS HELP SPEED MODERN PAINTING PROCESSES—CUT COSTS)



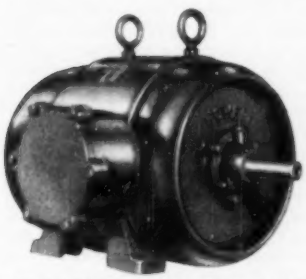
4 **Today**—Modern, electrically driven paint and varnish machines (like this automobile paint spray booth handling 50 bodies an hour, equipped with 3 Howell totally enclosed explosion-proof motors) speed production, cut costs, protect, preserve and add sales appeal to thousands of products.

Throughout the paint and varnish industry, you'll find precision-built Howell Motors powering agitators, chasers, conveyors, crushers, fillers, mixers and other time-saving equipment.

Proved and practical Howell Motors, from 1/6 to 150 H.P., are available to you in a wide range of sizes and types. Why not investigate TODAY?

Equipment courtesy Schmieg Industries, Detroit

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.



Howell totally-enclosed, explosion-proof motors for use where inflammable liquids or gases are handled or stored.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

Ground-from-the-solid, Jarvis high-speed steel TECNI-TAPS save you 10%, and more, on procurement costs alone. Jarvis TECNI-TAPS have not gone up in price. Substantial savings are made when you work with Jarvis factory-trained representatives. Details, like number of flutes, lands, proper chamfer, are determined by these experts to create the TAP best suited to your tapping job. To get the most in profitable, trouble-free service from your TECNI-TAPS, investigate the Jarvis TORQOMATIC tapping attachment — there are savings for you with TORQOMATIC too! Address your requirements to The Charles L. Jarvis Co., Middletown, Conn.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS
TECNI-TAPS and DIES
ROTARY FILES
FLEXIBLE SHAFTS and MACHINES
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Therefore, foremen, if you must blow off steam—think twice before you do so and then pick another foreman who perhaps feels the same way you do on the subject and really have a session with him. Never confide in a subordinate unless you want to lose all respect of your workers and perhaps some day your own job.

Charles D. Townsend
Fort Wayne, Ind.

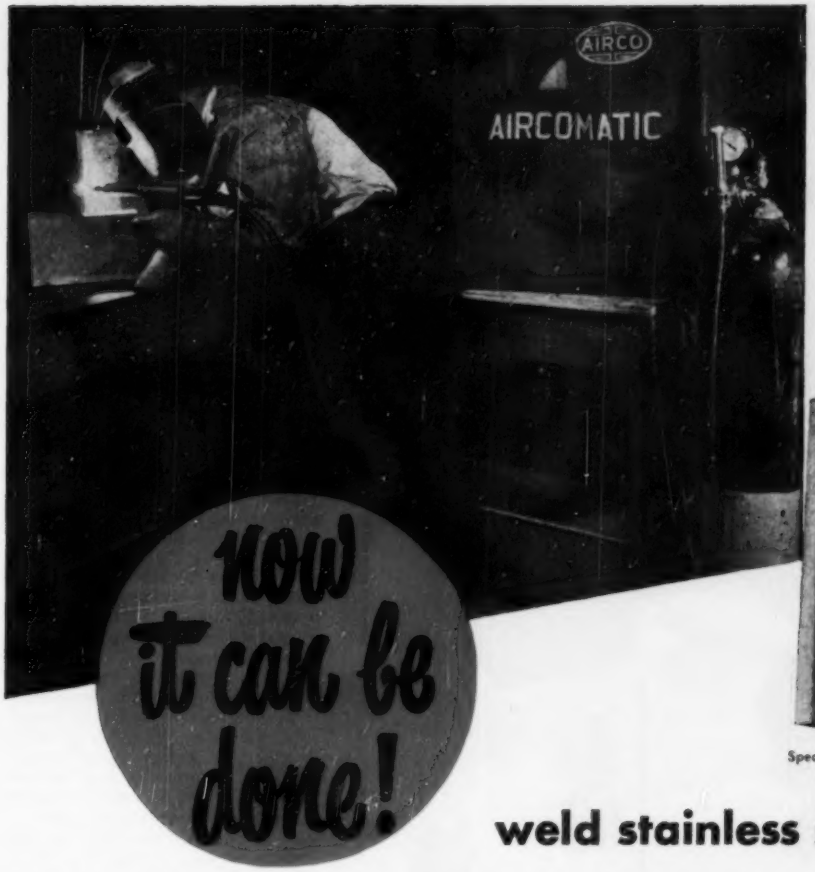
•

THE ITCH TO TRAVEL

The desire of Hamilton, or any other man, "to travel" can be prompted by so many different reasons that to assume, as Al seems prone to do, that its realization should be discouraged seems like "begging the question." The particular reason may be the urge to see other works, other kinds of work and other methods; to gain experience; the health of one's self or one's family; the wish to be nearer one's own or the wife's relatives; or it may be just wanderlust. Is there anything sinister in any one of these reasons? Has Al considered that if he should ever need additional help, start a second or third shift, the men required would have to be recruited from the ranks of these same travelers? It may be worthwhile to consider the question further from another angle.

The poet has said, "What knows he of England who only England knows?" To apply the truth in this case, what knows he of production practice, who only one shop knows? In either case, no basis of comparison would exist and the knowledge existing would be onesided.

Is not the greater difficulty likely to be felt with the non-travelers; those who have never left the shadow of the village pump. A shop full of such men is likely to become self-satisfied and conceited; they may get to think that their own little shop is the hub of the engineering production universe. A young London journeyman, who had never left the works where he had learnt his trade, made no attempt to conceal his contempt for the qualifications of a young countryman, who, having felt the travel itch, had recently joined the works force. The Londoner had had the "advantage" of being brought up in a shop replete with all the gages, templets and gadgets any one could wish. His boast was that he could go into any shop in the country and hold his own. A few questions put by the countryman speedily debunked the Londoner's conceit, who realized that there was still something to be learned and other worlds to conquer.



Specimen of AIRCOMATIC welding stainless — vertical down.

weld stainless steel with new high-speed AIRCOMATIC process

Now, stainless steels in all standard joint designs, in thicknesses of ⅛ inch plus, can be welded faster *in all positions.*

You can make single or multi-layer welds by either beading or weaving. Vertical welds can be made upward or downward. In short, the Aircomatic Process permits the welding of stainless with all the ease and versatility of ordinary steels — at a high rate of deposition and with complete freedom from slag.

Continuous feeding of filler metal, and inert gas (helium or argon) shielding, are the two main features that give this new welding method its exceptional speed and flexibility. A bare filler metal, in wire form, is fed continuously through a manually-operated gun . . . and, of utmost importance, the process deposits a weld metal with an analysis almost identical to the filler wire — even approximately 60% of the titanium in the filler wire is transferred to the deposited metal.

Investigate the many advantages this new *Aircomatic Welding Process*, for welding stainless steels, aluminum and other metals, can offer you. *If you desire more information in the form of a descriptive folder, delivery and price data, fill in and mail the coupon below.*

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These tools will be demonstrated in Booth No. 430 at the ASTE Show in Philadelphia, April 10-14.

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Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
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No Al, do not belittle the traveler, he may be your best friend yet and you should be able to pick out a waster, whether he has roamed or remained anchored to the local pump. Do not plump for a man "who may know not and know not that he knows not. He would be a fool, shun him."

J. E. Powell
Lincoln, England

NEW BOOKS

TEXT IN PATTERNMAKING—*By Alexander V. Hanel, Instructor, Boys Technical High School, Milwaukee, Wis. Published by the Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. 314 pages, Price $2.96.*

Written as a student text, this book is for secondary vocational and technical courses. It is a valuable book to those who study patternmaking, whether they plan the subject as a career, or as a background for engineering. There are few books on this subject available; this one appears to be comprehensive.

Fourteen chapters cover every phase of pattern construction including a final section on foundry practice. Following Chapter 14 is a 74-page "job" section which describes in detail 40 projects, progressively more difficult, to provide 8 semesters of training. Chapter headings include subjects such as Tools, Lumber, Machinery, Layout, Joinery, and Cores, while "jobs" start with a simple angular block and end with a screw propeller. An appendix includes a glossary of patternmaking and molding terms, plus an index—both are extensive.

Although intended for students, this text might prove helpful in the reference library of any firm that works with castings.

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PRINCIPLES OF ELECTROPLATING AND ELECTROFORMING *(3rd Edition)—By William Blum and George B. Hogaboom. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 455 pages. Price $6.*

Since the first edition of this book in 1924 and the second in 1930, so many important advances have been made in the electroplating field that major revisions have been necessary in this third edition. The book summarizes existing knowledge of plating theory and practice, and explains the electrical and physical principles

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New Rotor "Multi-power" Chipper gets into crowded quarters ...gets the job done faster

The "doughnut" valve of the 15 new Rotor "Multi-power" Chipping Hammers makes possible greater compactness of design and gives faster cutting. It is a real "cost-sinker".

Shorter and lighter. The 15 new "Multi-power" Rotor Chippers average 1" to 2" shorter than other chippers—easier to get into corners. It weighs 1½ to 2 lbs. less than other hammers—easier to handle.

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Faster. New exclusive design of valve and hollow piston gets jobs done faster.

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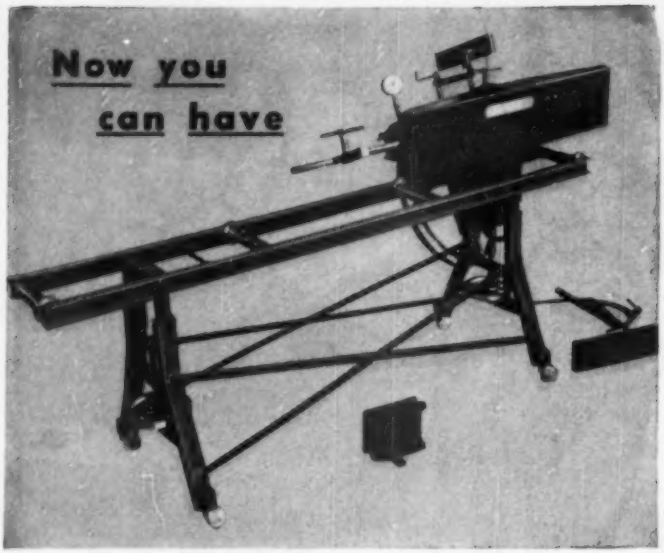

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Automatic Bar Feeder
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Wells-O-Bar
FEED MASTER

Owners of Wells No. 8 and No. 12 Machines or other horizontal metal cutting band saws can now convert these units into fully automatic bar stock cut-off machines at very modest cost. The new Wells-O-Bar Feed Master accurately feeds bar stock in a variety of shapes and sizes into the machine and automatically controls the saw frame through each cutting and resetting cycle. Requires only 60 to 80 pounds air pressure. Safety features eliminate necessity of constant attention. Precision made by the world's foremost manufacturer of horizontal metal cutting band saws, the Wells-O-Bar Feed Master improves blade efficiency and slashes multiple cutting costs. Write for details and prices.

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METAL CUTTING BAND SAWS

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upon which electroplating depends.

This edition is more scientific and technical than earlier editions because the entire electroplating industry has become more scientific, but the new developments described have been couched in simple terms so they can be readily assimilated and applied by those directly engaged in plating operations. Analysts will find particularly valuable the new arrangement of all the methods of analysis of plating solutions in one chapter.

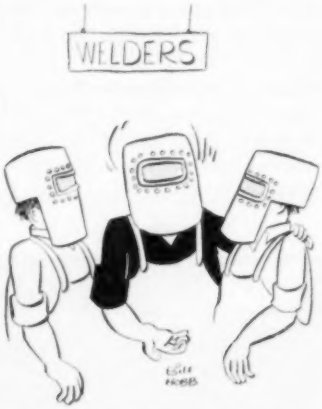
There is a full treatment of each of the commonly used metals, dealt with in the same sequence as in the periodic system of the elements. There is also a full discussion of the preparation necessary for electrodeposition on plastics, as well as a comprehensive explanation of alloy deposition.

•

ELECTRIC ARC WELDING PROCEDURE AND PRACTICE—*Published by Hobart Trade School, Inc., Box EW-146, Troy, Ohio. 544 pages. 5½x8. Price $3.*

A thoroughly practical handbook covering in considerable detail the procedure and practice of arc welding. It is designed for both the student and the practicing welder, and is equally useful to the executive.

The first section gives general information on welding and discusses types of joints, electrodes, equipment and basic procedures. The second part is intended as a complete self-study course and incorporates practical exercises and quizzes. Part three is devoted to carbon-arc welding, and part four to other electric welding processes. Part five reproduces standard welding terms and definitions as approved by AWS.



"Hank, I want you to meet Stan, your new helper"

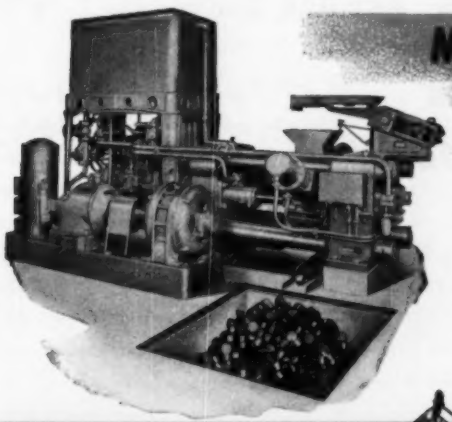
CASH IN YOUR Chips!

Comparison of borings and turnings, before crushing, after briquetting.

Why Hang on to Bulky Scrap When You Can Turn It into CASH — Quickly and Easily!

Yes sir! It's like trading white chips for blue ones. With a Milwaukee Briquetting Press, you can easily convert your bulky borings and turnings into more profitable, compact briquettes. You not only conserve valuable floor space, but the briquettes give you a clean, machineable metal, made of your own scrap, and of known analysis. Briquetting means EXTRA PROFITS . . . the result of more efficient scrap handling.

Investigate the value of your chips! A Milwaukee Foundry Equipment Engineer will gladly help you. Write — today.



Milwaukee Hydraulic BRIQUETTING PRESS

Model No. 350, shown here, compresses bulky scrap into compact briquettes (from 4¼" to 5" in diameter) at the rate of 720 briquettes per hour. Steel, cast iron or non-ferrous metal. Briquettes are uniform in size and density. Press is fully automatic. The entire briquetting plant, including, hoppers, conveyors, elevators, crushers, etc., can be completely amortized in 7 months to 18 months, depending on type and volume of borings or turnings used.

● **Look to MILWAUKEE when in need of Molding Machines, Core Blowers, Core Grinders or Briquetting Presses. Write for descriptive literature.**

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MILWAUKEE *Foundry Equipment*

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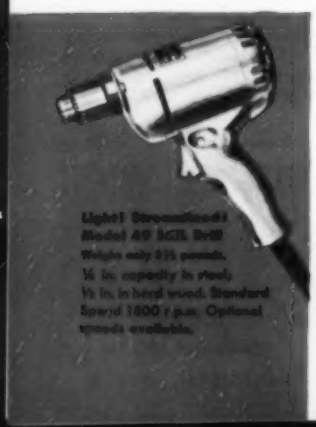
Now the new SKIL Drill model 49

FIRST with the famous LAMB *Wedge-Lock* HANDLE!

TRY New Model 49 Today! Feel how scientific, patented Lamb Wedge-Lock Handle makes this great new SKIL Drill seem even lighter than it is. See how comfortably and naturally weight is spread between thumb and fingers. Feel how surely it gives safe, firm, easy control.

Here's a drill any operator will take to the minute his hand takes hold of it. Compact, light, tailored to meet latest aircraft industry specifications, Model 49 SKIL Drill will boost your production by hundreds of holes per day. Ask your SKIL Tool Distributor to demonstrate *today!*



Light Streamlined Model 49 SKIL Drill Weighs only 3½ pounds. ¼ in. capacity in steel, ½ in. in hard wood. Standard Speed 1800 r.p.m. Optional speeds available.

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...after using
WEST LAN-O-KLEEN HAND CLEANSER
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Figures don't lie—and cold figures from plant after plant of every size confirm this fact: That WEST LAN-O-KLEEN is *more* than just a fast-acting powdered hand cleanser that washes away stubborn grit, grease and grime with remarkable ease and thoroughness. It's a *safety* measure that actually helps reduce industrial skin infections — thus lowering absenteeism and production costs to a notable degree. Like all sanitary products formulated exclusively by West, LAN-O-KLEEN possesses that "little something extra" that makes it *extra*-ordinary. It contains no harsh abrasives — no excess alkali to harm the skin. What's more—its fine corn meal base is impregnated with an *extra-generous amount of lanolin* — thus helping to combat the loss of natural skin oils.

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SEND FOR FREE SAMPLE

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Gentlemen:
Please send me a free sample carton of LAN-O-KLEEN.

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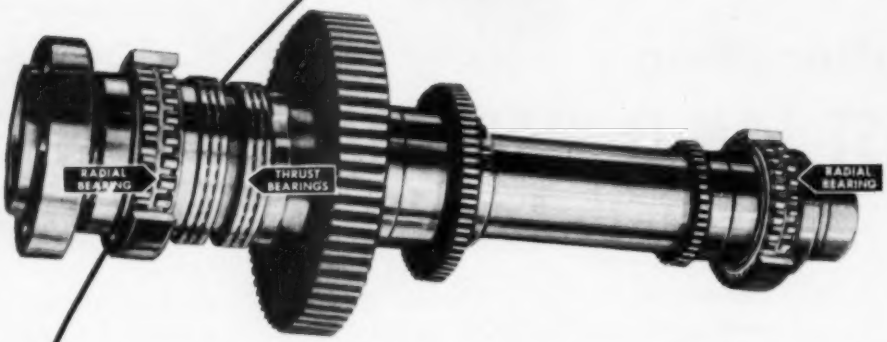
30

when you want THIS →

. . . but get THIS →



. . . look into the SKF spindle design that provides

from 100% to 500% GREATER SPINDLE RIGIDITY

When the going's hard and the cuts are heavy, here's how to say "Goodbye" to chatter. Equip your machine tools with the SKF Spindle which yields under load *as low as one fifth that of ordinary designs.*

RADIAL RIGIDITY IS PROVIDED BY THE DOUBLE ROW CYLINDRICAL ROLLER BEARINGS

Why?

Because the outer ring roller path offers no resistance to axial movement. Therefore, the outer ring is mounted with a press fit in the housing to increase rigidity.

Because a tight fit on the tapered spindle seat eliminates creep and gives rigid support to the inner ring.

Because internal clearance of the bearing is removed by expanding the tapered bore inner ring on the spindle.

Because the cylindrical rollers are lapped to closest tolerance, so that correct load distribution within the bearing is always assured.

Because the roller paths are ground and honed.

Because the great number of rollers and their staggered arrangement insure efficient load distribution and virtual elimination of bridging effect.

AXIAL RIGIDITY IS PROVIDED BY THE BALL THRUST BEARINGS

SKF Catalog No. 272-A tells how this spindle design can be adapted to your particular requirements. SKF Industries, Inc., Phila. 32, Pa.

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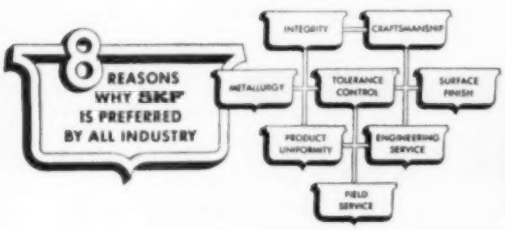

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BALL AND ROLLER BEARINGS

Pioneers of the Deep Groove Ball Bearing—Spherical Roller Bearing—Self-Aligning Ball Bearing

PURIFYING THESE 3 OILS PAYS *Special* DIVIDENDS

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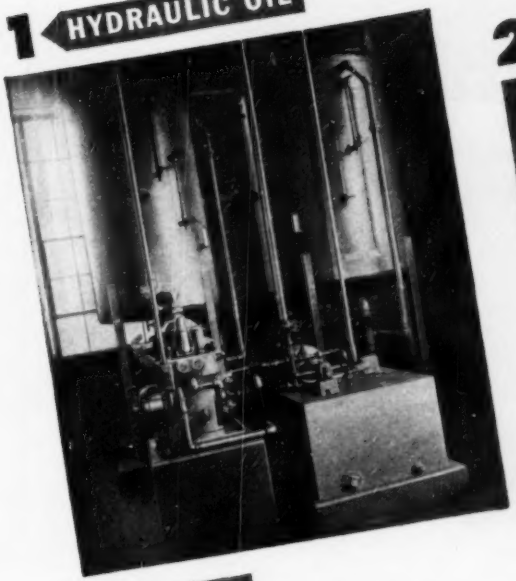

2 TEST OIL

3 CUTTING OIL

1 Removal by means of De Laval centrifugal machines of the condensate that tends to rust pumps, valves and controls and causes seals to harden. Simultaneous removal of dirt and sludge prevents scoring of finished surfaces.

2 The De Laval Oil Purifier removes metallic particles, grit and water from lubricating oils in circulating systems of automobiles. Result: cleaner motors, more oil savings.

3 Centrifugal force removes abrasive and metallic particles from cutting oil—insures faster, smoother cutting. Also more consistent accuracy and less machine "down" time. Purification saves tools as well as oil. Write for Bulletin MM-1.

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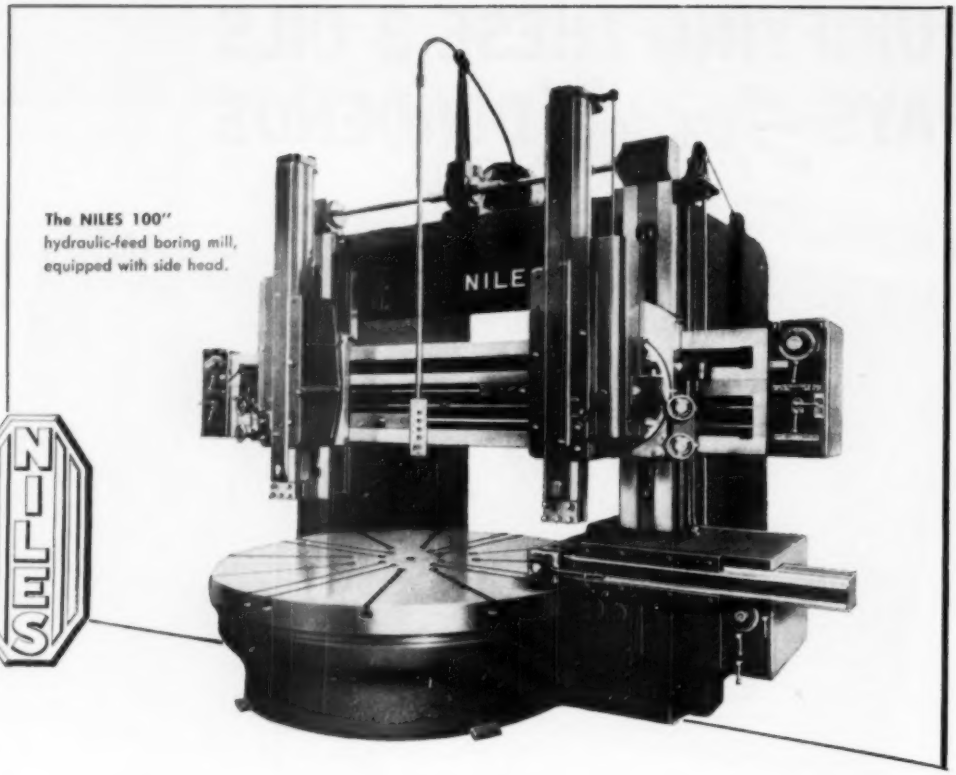
Save More than the Oil with—

DE LAVAL

PURIFIERS and CLARIFIERS
FOR FACTORY OILS



The NILES 100" hydraulic-feed boring mill, equipped with side head.

NILES hydraulic-feed boring mills

Massive construction of Niles boring mills assures ample rigidity to take the stresses of high-speed cutting—yet with no loss of accuracy. You will get considerably faster boring and turning, particularly with tungsten-carbide tools.

With fingertip control of the hydraulic feed, your operator can effortlessly and efficiently operate his mill. He has, for example, infinite feed selection while the machine is running—he can make fast tool placements. Reduced operating fatigue will tend to improve his accuracy.

Eighty years of building large boring mills stand behind these new Niles machines. You will find them precision products in every respect, designed to give you better production—consistently.

* * *

Niles Vertical Boring Mills are built in all standard sizes from 72 inches up, with either hydraulic or mechanical feed and with or without side head. For further information, call the Lima-Hamilton sales offices in New York, Chicago or other principal cities, or write directly to Lima-Hamilton Corporation, Hamilton, Ohio.

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DIVISIONS: *Hamilton, Ohio* — Niles Tool Works Co.; Hooven, Owens, Rentschler Co. *Lima, Ohio* — Lima Locomotive Works, Inc.; Lima Shovel and Crane Division. *Middletown, Ohio* — United Welding Co.

PRINCIPAL PRODUCTS: Niles heavy machine tools, Hamilton diesel and steam engines, Hamilton heavy metal stamping presses, Hamilton-Kruse automatic can-making machinery, Locomotives, Shovels and cranes, Special heavy machinery, Heavy iron castings, Weldments.

the ZIP saves *my* time *your* money

That's the big thing about this little hoist!

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In thousands of plants "thru-the-air" handling with the Zip-Lift is saving time—earning money... beside machine tools, along assembly lines, around loading docks, receiving rooms, warehouses—wherever the handling of loads up to 2,000 pounds can be turned into a push button job.

What are your chances for making money with the Zip-Lift? Any P&H Representative will show you where—and how—and how much profit it will earn for you.

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Handle it "thru-the-air" at lower cost

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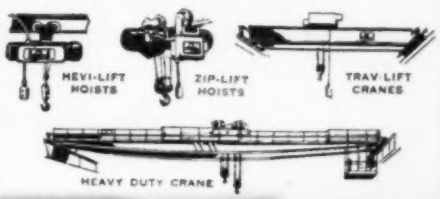

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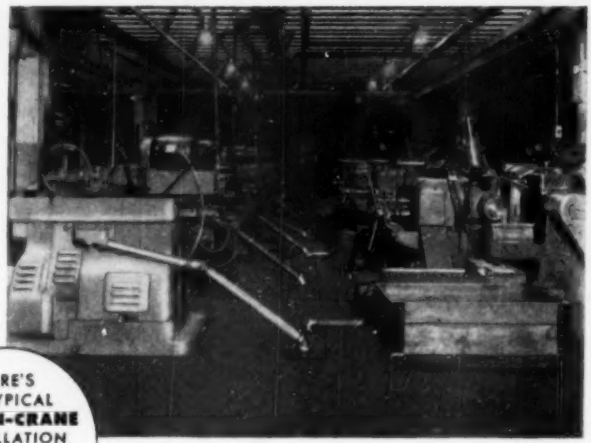
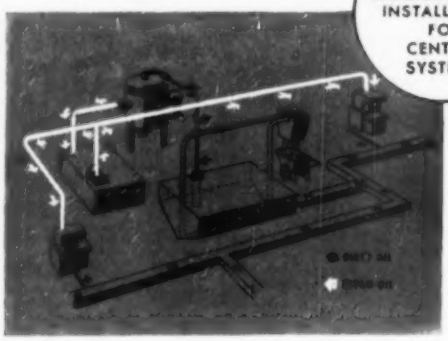


General view of grinding department in a Midwestern manufacturing plant. Here the installation of a central coolant clarification system, serviced with Honan-Crane and Houdaille equipment, has resulted in actual savings of $30,000 annually.

HERE'S A TYPICAL **HONAN-CRANE** INSTALLATION FOR CENTRAL SYSTEMS



For larger metal working operations employing as many as several hundred machines of various types, the continuous central system is recommended for either oils or coolants.

In the typical installation shown at left, dirty coolant flows in floor trenches from individual metal working machines to dirty coolant tank. Here the dirty coolant flows over baffles. The larger metallic particles settle to the bottom of the tank. The accumulation of sludge, chips, abrasives and other solid matter that settle out are removed from this tank by a Houdaille Continuous Conveyor.

Coolant is pumped continuously from dirty coolant tank to Houdaille automatic clarifier for removal of contamination held in suspension. Clarified coolant is returned to clean coolant tank. Overhead lines, leading from this tank, supply the individual machines with clean coolant.

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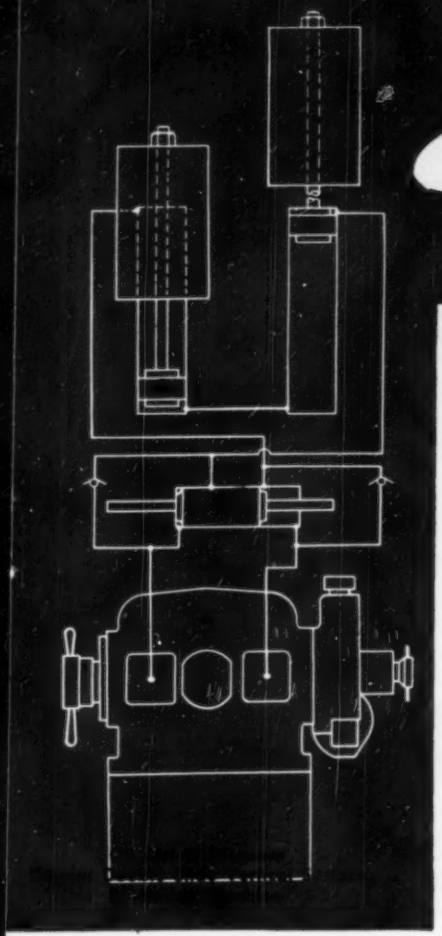

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B. Interlock Cylinder for Operating Shuttle Tables.
C. Left Hand Tool Slide Cylinder.
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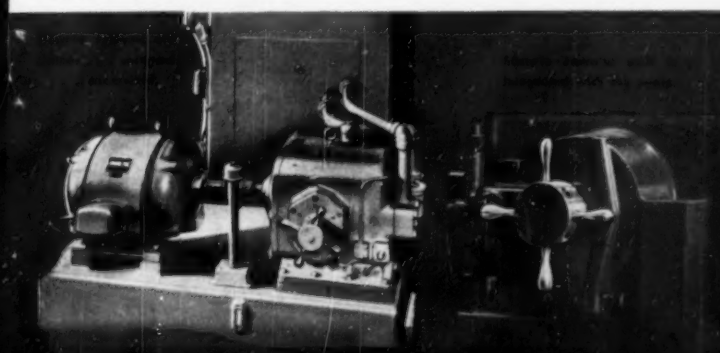

Oilgear
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Don't let screw failure cancel savings

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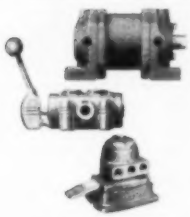

2

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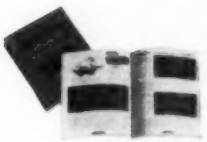

3

Informative Literature

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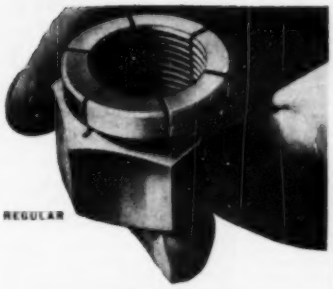

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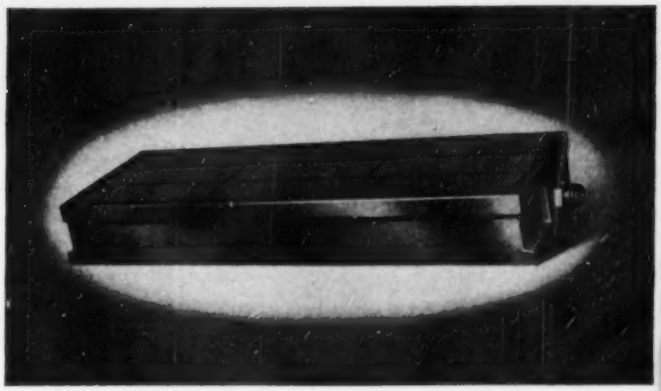

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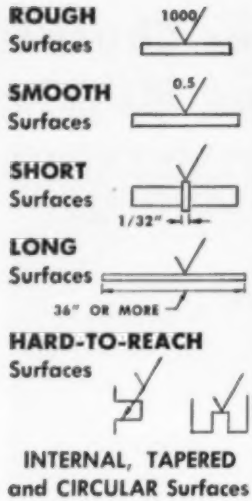

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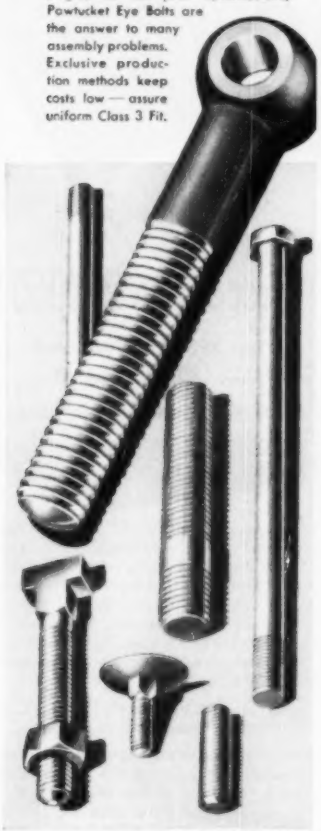

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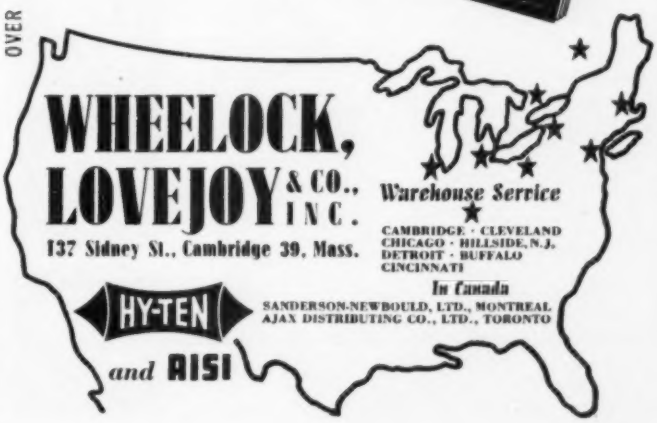

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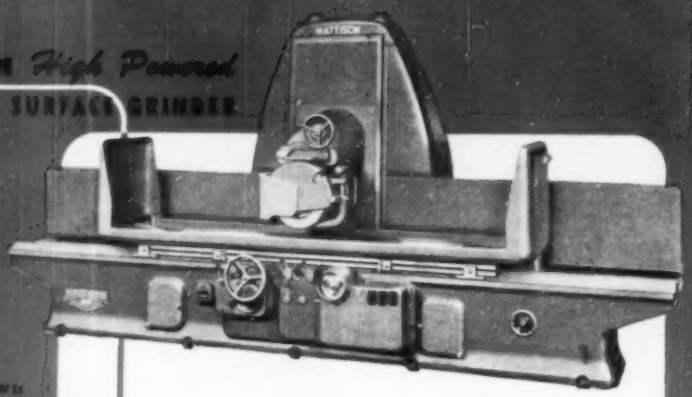

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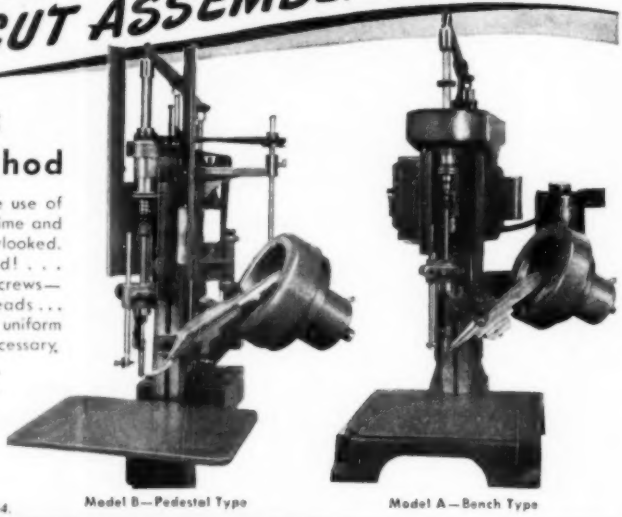

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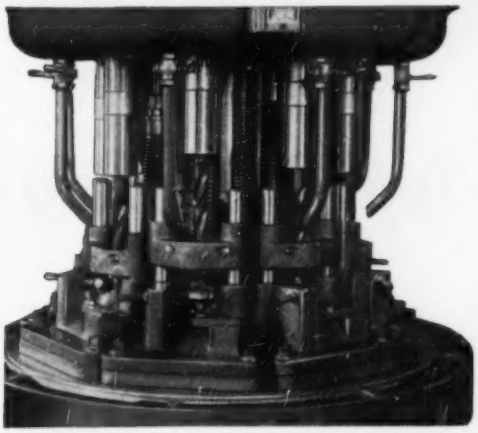

DRILLING 1" DIA. HOLE IN TWO TYPES OF PARTS AT 960 PER HOUR

Two types of bicycle handle bar stems are machined on this Model 8SV vertical drilling machine. The illustration above shows fixture design for holding both types of parts. The hole drilled is 1¼" deep, partially cored, and 1" deep. Parts are drilled at the rate of 960 per hour in a machine with a base only 6 ft. in diameter. Here's why production like this is possible:

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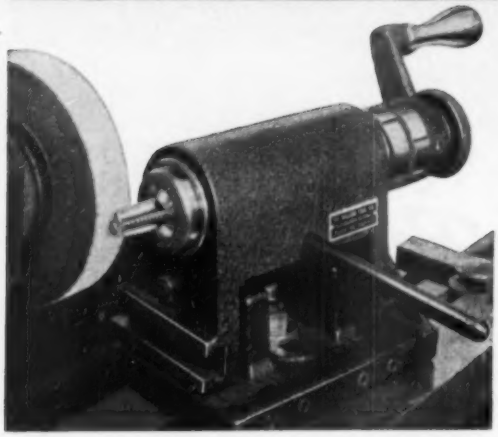

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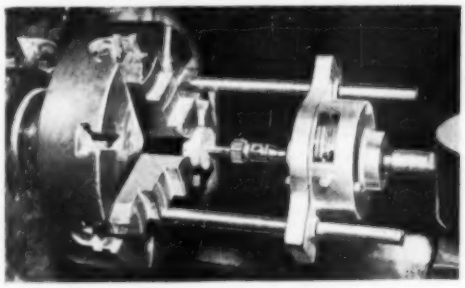

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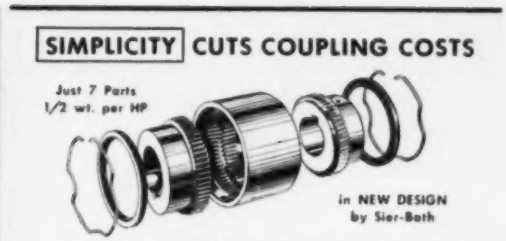

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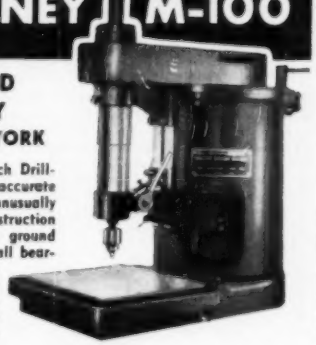

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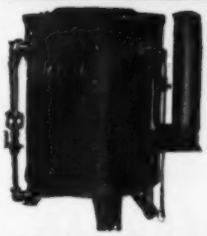

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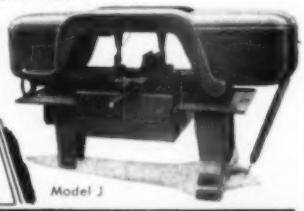

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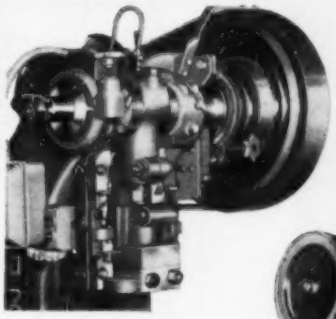

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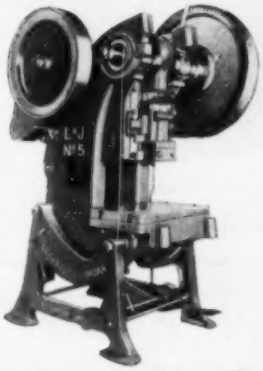

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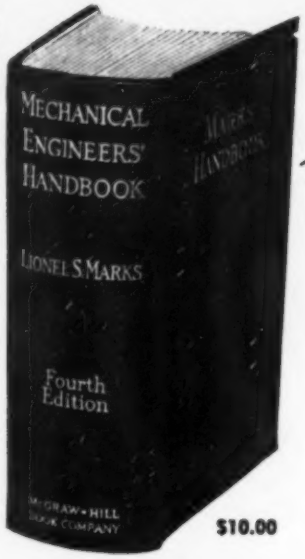

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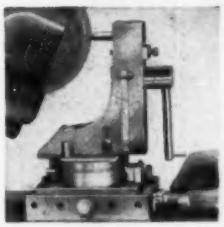

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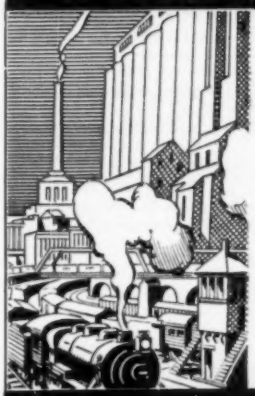

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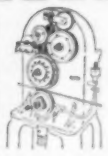

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1⅛" Greenlee, 6 Spdls. (1941)
No. 01 New Britain 6 Spdls. 1⅛" (1942)
No. 6 Brown & Sharpe, M.D.
No. 49 New Britain, 4 Spdl. Chucker
Model A 1½" Cleveland (1943)
Model A 3⅝" Cleveland (1942)

DRILLS
No. 150 Baker, (1942)
No. D8 Colburn, No. 6 Morse Taper
No. 200—38" Defiance #5 Taper (1943)
No. 1-LMS Leland-Gifford (1942)
No. 3-LMS Leland-Gifford (1942)
No. 4-BM Fosdick 4 Spdl. (1942)
No. 6-BM Fosdick 6 Spdl. (1942)
No. 4BL Natco 36 Spdl. (1943)
3'-10" American Triple Purpose, M.D.
5' Western Heavy (1942)
6'-17" Fosdick Hyd. Economax Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 16H Gould & Eberhardt
72" Cincinnati Gear Cutter

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
No. 2 Lambert 4" bar
No. 46-B Heald Bore-Matic (1942)
No. 113—C Excello 2 Spdl. (1942)
36" Bullard Hi-Speed (1942)
42" Bullard (1944)
42" Colburn, M.D.
60" Colburn, M.D.
64" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
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Norton Motorized Grinders ranging from 6"x18" 24"x240"
No. 34 Abrasive Surface Grinder (1943)
No. 25—16" Heald Rotary Surf.
No. 36-A Hanchett Rotary Surf. (1942)
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
Bryant Internal Grinders (1942)

LATHES
14"x30" centers Pratt & Whitney, Model C
16"x54" centers LeBlond (1941)
18"x6' American, Gdr. Head, M.D.
16"x54" Monarch
20'x72" centers Monarch
38"—48"x18' Lehman Hydratrol (1945)
36"x24' Lodge & Shipley Gdr. Head
8"x15" Sundstrand, Model D (1943)
10" Sundstrands, (1942, 1943)
16" & 20" Fay Automatics (1942)
No. 4 Gisholt Univ. Turret Lathe, (1942)
No. 4R Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 1-H Libby, Extra Long Bed (1942)

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No. 2H Milwaukee Plain (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 2D Milwaukee Rotary Head Miller (1946)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mfg. (1942)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex (1943)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 58-72 Cincinnati Hydromatic
No. 58-90 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
12"x24" H.T. Lees-Bradner (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
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36"x36"x18' Gray Maxi Service, 4 Heads
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PLANER—N. B. P., 48" x 48" x 26', 4 Heads
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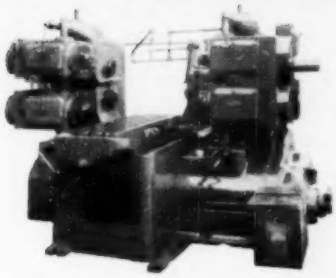

Cincinnati #4-36 4 Spindle Duplex Hydromatic Milling Machine. Close Coupled Spindle Carriers. Spindles have Micrometer Adjustment. 220/440 motor.

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#1M Cincinnati Horiz. Rect. Overarm.
#3 Dial Type, H.S. Cincinnati Vertical Mill.
#2, #3, #4 Cincinnati High Power Vert.
#4-36 Cincinnati 4-Spdle. Duplex Hydromatic.
#4-36 Cincinnati Plain Hydromatic.
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Cincinnati #0-8 Automatic Horizontal.
Cincinnati #0-8 Vertical.
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24"x16' American, 11' C.C. Taper Att.
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20"x10' Hendey Q.C.G. Taper Att. Motorized.
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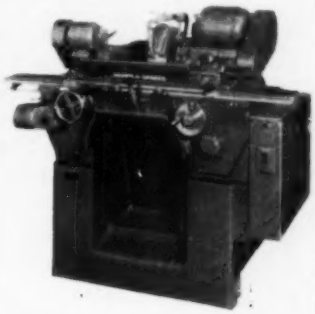

Brown & Sharpe #5 Plain Cylindrical Grinder. Size—3"x12", 4 work speeds and 6 table speeds. 220/440 motors. IMMEDIATE SHIPMENT.

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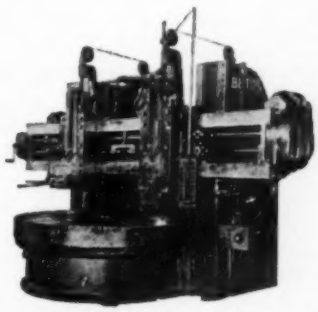

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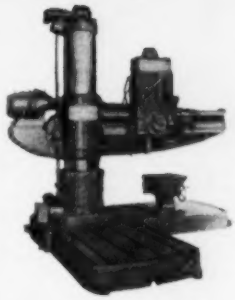

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W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
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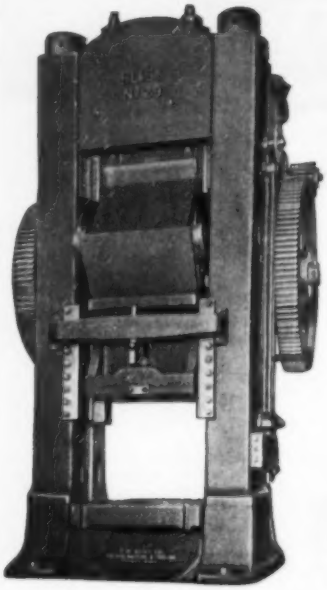

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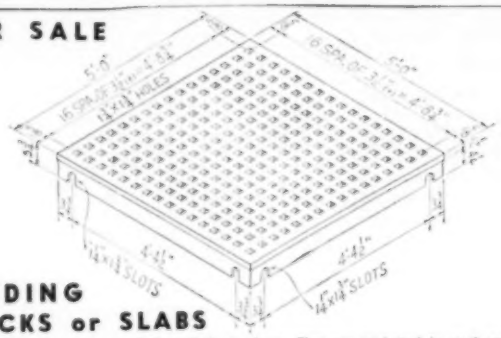

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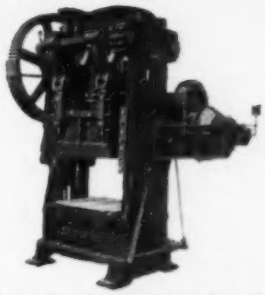
GRINDERS, MISCELLANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Cinc. No. 2 Centerless Filmatic.
Cinn. 12 x 36", 12 x 48" Filmatic Univ.
Covel No. 91A Univ. Tool & Cutter.
Gardner #226, 30" Disc.
Heald 72A3 Sizematic Int. Centerless.
Jones & Lamson Thread, Univ. TG36
K.O. Lee Tool & Cutter.
Landis Centerless.
Landis No. 4H Cyl. 4x 12", No. 6 Thread.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 4G Drill Grinder

GRINDERS, SURFACE
Abrasive No. 33, 34 Vert., 8 x 24
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe No. 5, 8x24" Hydr.
G. & L. No. 25, 35 Hyd., 6 x 18", 8 x 24".
Hanchett Model 300, 13 x 48".
Norton 6 x 18". Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Pope Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18".

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'.
Hardinge Precision, 1" Collet Cap., Rivett. Precision.
Hendey G.H. 16x30", Rel. Att.
LeBlond Regal 10"x3½', 15"x30", 16"x40" TA, 19"x48" TA, 21"x 60"



Bliss Double Crank Toggle Press No. 406— 48"

Bliss No. 304A, 305A, 306 Straight Side Presses.
Bliss #8—Bed 42x96"—250 Ton.
Bliss 645B, 650, 675 High Production Presses
Henry & Wright 75, 25 Ton Dieing Presses

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR. OPENING	PLATEN
Lake Erie	500	36"	48½	35 x 36
Baldwin Southwark	400	32"	36"	76 x 59
H.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24' bed.
Denison	25/50	18"	23"	22 x 20
Hanalfa	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	150	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	48½"	42 x 32

UP MOVING RAM PRESSES

Waterbury Farrel	1000	7"	55½"	30 x 28
Waterbury Farrel	800	6½"	28"	22 x 24
Waterbury Farrel (3 Rod)	500	6"	28¾"	28" Bet. Rods
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
Watson Stillman (Hob) New and Used	300	6"	22"	16 x 16
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	100	7"	24"	22 x 15
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Bolling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES—400 ton 96"; 500 ton—48"; 300 ton—48".

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (13 gal) Hydr. Pass.	42 x 9 x 48"	3000

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21.
Cincinnati No. 1-12, 1-18, 2-18 Mfg.
U. S. Multimiller, 1 and 2 Spindles.
Sundstrand 00 Rigidmills, Nichols, Kent Owens IV.

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B. & S. No. 2B Plain
B. & S. No. 2A Univ.
Cincinnati No. 3 Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain.
Van Norman Duplex, 12, 20, 22L, 36.

MILLS, VERTICAL
Bridgeport, Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9J Plain, 8½D Duplicator.
Kearney & Trecker, 3H, High Speed
Moore Jig Grinder.
Morey No. 12M Profiler 2 sp.
Sipp MP6 Jig Borer.

PRESSES
Bliss No. 30A, 4" Str. 23"x24"
Bliss No. 305A, 4" Str. 30" x 30"
Bliss No. 645B, 650, 675 Hi-Production, 58, 62, 62A, 162.
Bliss No. 8 42"x96", 250 Ton
Bliss No. 4½ Double Action Cam
Henry & Wright Dieing, 25 Ton, 75 Ton.
L & J #22, 3, 4, O.B.I.
Reliance 45 Ton, O.B.I.
Gen. Screw Press.
Z. & H. 30 Ton, O.B.I.
Stokes Tablet Presses, Model R & T.

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Acme No. 4W, 6W Bar and Chuck, Acme Fux.
Bardons & Oliver No. 3, 1¼" cap., No. 5, Chuck.
Brown & Sharpe No. 1, 2F, Foster No. 3B.
Gisholt No. 4, 5 Bar and Chuck, 1L.
J. & L. No. 3A, Well Tooled, Excellent, Saddle type.
Warner & Swasey No. 3, 4, 5, Preselector, No. 4A 8" Cap.

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Bending Roll: Buffalo No. 0, Excelsior 14, Buffalo Wrapping Roll No. ½p.
Broach, American Horiz. Hyd. H-15-60.
Hacksaw: Marvel Nos. 4B, 6 and 6A Automatic Feed.
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Shaper: Vernon 12" Brand New Shaper—P&W 6" Vertical.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis
Rivet Hammers: Hi Speed, Chic. Pneumatic.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
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Tapper: Bakewell #1, Haskins 3C, 2C.
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TAYLOR & FENN—N-60 Duplex Spline
RICE BARTON—Model K Duplex Spline
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MOREY—12"x60" Thread Miller
LEES-BRADNER—840A Thread Miller
HALL-PLANETARY—Type "B" & "C" Thread
KAUFMAN—5A—Tapper, Lead Screw Type
MURCHEY—#23—Tapper, Horizontal

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JONES & LAMSON—TG-636 External
JONES & LAMSON—TG-1245 External
JONES & LAMSON—TG-125 Internal

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LANDIS—6"x18" Type "C" Hydraulic, Plain
LANDIS—18"x10" Type "C" Hydraulic, Plain
LANDIS—10"x32" "Type D" Crankpin, Hydraulic
CINCINNATI: #2 Centerless
CINCINNATI—6"x16" Hydraulic, Filmatic
CINCINNATI—10"x72" Hydraulic, Filmatic
NORTON—12"x36" Model "C" Universal
BROWN & SHARPE—No. 5, 10 & 23

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HEALD—72AU Plain & Universal
HEALD—72AS Sizematic
HEALD—172 Gap Bed, Sizematic
BRYANT—112 Universal, Hydraulic
BRYANT—10-28 Hole Grinder
BRYANT—24-36 Heavy Duty
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THOMPSON—12"x16"x48" Type "C" Hydr.
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ARTER—Model A-1, 8" Rotary
GARDNER—Model 120A Opposed Hd. Disc Grinder

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MICROMATIC—Model H-2 Hydrohoner, S.E.

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Nos. 3E & 3H K. & T. Pt. Dial Millers, late
No. 36 Van Norman Pt. Miller, ram, '43
No. 3G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicators, late
No. 8J Gorton Duplicator & Vert. Miller (2)
12"x24" G. & L. No. 45 Surface Grinder, '42
No. 70A Heald Internal Grinder, 1942
Gear Cutter, No. 13 B. & S., spur & bevel
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30"x120" Hanchett Plano Surface Grinder
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Cincinnati 6x18 Cylindrical Grinder
Cincinnati Mamuset Cutter Grinder
Cincinnati #2 Tool & Cutter Grinder
Covel #15 Surface Grinder
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Wicks 36x16' Bed Engine Lathe
Libby 3M Turret Lathe
LeBlond #4B Gun Boring Lathes

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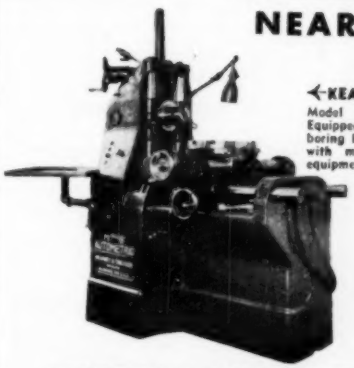

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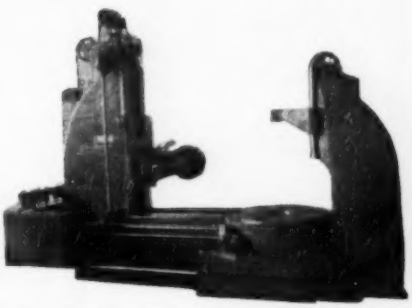

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CANAL 6-5575

CHECK THIS LIST OF FINE TOOLS

AUTOMATICS

½", No. 0G Brown & Sharpe
9/16" Acme Gridley model R8
⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
1⅛" Greenlee 6 spindle
1¼" New Britain 6 spindle
1⅞" Conomatic 8 spindle
2"x18" Cleveland model B
2⅝" Acme Gridley model RA6
6" Bullard Multamatic
No. 2 FU Foster Fastermatic
No. 18 New Britain 6 spdl. chucker
14"x18" Fay chucker
No. 5DE2 Potter & Johnston

BROACHES

10 ton 36" stroke Colonial duplex surface
15 ton 36" stroke American duplex surf.
No. 1 Foote Burt duplex surface
3 ton American horiz. hydraulic
No. 3 Oilgear horiz. hydraulic
No. 10-72 Colonial horiz. hydraulic
No. 9 Lapointe screw type
10"x72" Colonial broach sharpener

DRILLS, MULTIPLE

42 spdl. No. B 18 Natco
36 spdl. No. 30 Natco
24 spdl. No. B4A Natco
22 spdl. No. 14 Natco
16 spdl. No. 2 BL Natco
12 spdl. No. 38 Natco rail
12 spdl. No. 25 Baush rail
8 spdl. No. 11 Natco

GRINDERS

No. 72A3 Heald Sizematic internal
No. 72A3 Heald Sizematic centerless
Nos. 72A3, 72A5 & 74 Heald plain
No. 75A Heald hand feed
Nos. 18A18, 18-28, 18-36, 18CP16 & 24-36 Bryant
Model MHI Saw-way hydraulic
Size IC Cranby internal
No. 2 Cincinnati centerless
No. 10 Blanchard surface
Nos. 3 & 34 Abrasive surface
8"x24" Wilmarth Mormon surf.
12" & 16", No. 22 Heald rotary surf.
18" & 24" No. 25A Heald rotary surf.
No. 2 Norton universal tool
Model 47 Sellers tool
No. 2H Pratt & Whitney tool
No. 51 & 510 Oliver drill
No. 10G Sellers drill
Nos. 35 & 35 Excello thread

LATHES, TURRET

Model 8.2 Denver
Nos. 2 & 3 G Morey
No. 4 Midland
Nos. 5 & 7 Bardons & Oliver
No. 9 Jones & Lamson
No. 5 Foster
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 2, 4, 5, 3AL & 28" Gisholt
24" & 36" Bullard vertical
No. 2 FU Foster Fastermatic
3"x36" & 4"x34" Jones & Lamson

MILLERS

No. 2H Kearney & Trecker univ.
No. 3 Cincinnati universal
Nos. 2AS & 3S Milwaukee plain
Nos. 2, 3 & 4 Cincinnati vertical
Nos. 2H & 3H Kearney Trecker vert.
No. 3V Van Norman vertical
No. 3 Kempsmith Maximill vert.
Nos. 1-12, 1-18, 2-18 & 2-24 Cinc. auto
Nos. 0-8 & 2-18 Cinc. Rise & Fall
Nos. 3-24, 34-36, 4-36, 4-48, 5-48, 36-72 and 36-90 Cincinnati Hydromatic
Nos. 1H-12", M18, M24 & 12-24 Kearney & Trecker
30", 42" & 84" Ingersoll Rotary
Nos. 4, 8, CT38 & 40 Lees Bradner thread

PRESSES

1000 ton Southwark hydraulic
1000 ton No. 666 Toledo coining
600 ton No. 2318½ Hamilton forging
350 ton No. F1350-42 clearing
48", No. 93½ Toledo double crank

MILES MACHINERY CO.
SAGINAW, MICH.

LATE TYPE MACHINE TOOLS

AUTOMATICS

6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1941.
2⅝" RA-8 Acme-Gridley. 1943.
1⅛" Greenlee, 6 spindle. 1942
9/16" RA-6 Acme-Gridley. 1942.

BORING MACHINES

No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS

5' 15" Cincinnati-Bickford. 1942.
3' 9" Morris "Mor-Speed". Latest.
25" Fosdick "Economax". 1941.
No. 217 Baker, box column. 1942.
No. 5 BM Fosdick, box column. 1942.

GEAR EQUIPMENT

3" Gleason Generator. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 645A3, 615A & 61A Fellows. 1944.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL

25"x48" Landis, Crankshaft. Like New.
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL

No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE

12"x16"x60" Thompson Hyd. Latest.
No. 22 & 25A Heald Rotary. 1943.

LATHES, ENGINE

45"x192" Axelson. 1942.
28"x276" Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

LATHES, PRODUCTION

Gisholt "Simplimatic". 1940.
No. 3A L&S "Duomatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET

42"x36" Bullard Vertical. 1943.
No. 1A, 2A & 3A Warner & Swasey. 1943.
No. 1 & 8½"x24" Acme Univ. 1943.
No. 2, 3 & 4 Warner & Swasey. 1943.
No. 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN

No. 5 Cincinnati. 1943.
No. 4 Cincinnati Dial Type. 1942.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION

No. 1-14 & 2-20 Kent Owens. 1942.
M-18 Kearney & Trecker. 1943.
No. 1224 Kearney & Trecker. 1942.
No. 3-36 Cincinnati Duplex, R & F. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD

6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
4"x9" Hanson Whitney. Late.

MILLS, UNIVERSAL

No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

MILLS, VERTICAL

No. 3B P&W Univ. Die Sinker. 1943.
No. 2K & 3H Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1942.
No. 1 Cleveland. 1942.

PRESSES

No. 40—51½ Minster. 1942.
100 Ton Hannifin, Hyd. Str. 1942.
50 Ton Denison, Hyd. Str. 1942.

INDIANAPOLIS MACHINERY & SUPPLY CO.
1961 S. Meridian St.
INDIANAPOLIS 6, IND.

Botwinik has BUYS! BUYS! $ $ $ $ $ *and more* BUYS!

LATHES

Lodge & Shipley 14"x6' and 8', 12 spd. sel. grd. Hd. 33½" and 58" C.D. attach, Motor in base.
Lodge & Shipley 30"x16', 12 spd. sel. gr. hd., 34½" swing, 110 C.D.
Monarch 20"x72" centers Model M 16 spd. Grd. Hd. 22½" swing Monarch auto. Sizing control (Late).
Leblond 33"-60" sliding gap lathe, 9'2" C.D. Gap Closed, 14'2" C.D. gap extended.
Jones & Lamson #5, 2½" cap. ram type Universal, bar and chucking.
Gisholt #5, 2½" cap. ram type Universal, Preselector head, thread attachment, bar and chucking, tooling.
Warner & Swasey #2A, 2½" cap., #3A, 4½" cap., saddle type, universal, rpd. trav. full length lead screw, bar and chucking.

BORING MILLS

Universal 4" bar "Tri-Way", face plate to outer support 72", #6 taper, added vertical range (late).
Defiance 25A, 3¼" bar, face plate to outer support 102", #6 taper, added vertical and cross range (late).
Lucas #41, 3" bar, face to outer support 72", #5 taper, (late).
Fisher 5" floor type vert. travel hd. 60", hor. travel cal. 110", platen (very late).
Bullard 24" and 36", "spiral drive" 24", 36" and 42" "New Era" type vertical, 3-jaw and 4-jaw chuck tables.

PLAIN MILLERS

Brown & Sharpe #2 lite type, wkg. tbl. 50½"x 10", range 28"x10"x15", rpd. trav. (late).
Milwaukee #5H med. spd. wkg. tbl. 24"x18", range 52"x16"x20", rpd. trav. (very late).
Ingersoll 48"x48"x16' D.H. Planer type Milling Machine wkg. tbl. 42"x18', one head on cross rail, 2 side heads, A.C. M.D.
Kempsmith #4 Plain—motor-in-base Maximiller, wkg. tbl. 13½"x64½"—range: 42"x 14"x20" (late).

PLAIN, INTERNAL & UNIVERSAL GRINDERS

Cinn. 14"x72", hyd. universal, film brg. (very late).
Farrel #30"x182" M.D. roll grinder, max. face ground 182" min. dia. ground 9".
Cinn. #2 and 3" centerless, film. brg., long bar and auto. infeed attachment (late).

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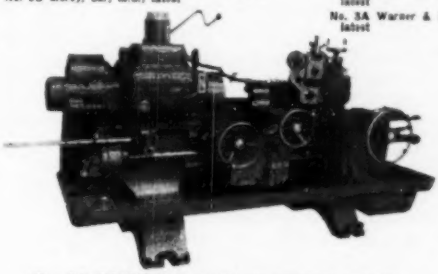
EASTERN OFFERS FROM STOCK
TURRET LATHES AND SCREW MACHINES

No. 1H Libby, m.d., chucking, latest
No. 1 Cincinnati-Acme Semi-Universal, m.d., chucking, Timken
No. 1F Foster Fastermatic, m.d., Timken
No. 1L Gisholt Universal, m.d., chucking, Timken
No. 1A Warner & Swasey Universal, chucking, pre-selector head, latest
No. 1A, 2A, 3A Warner & Swasey Universal, bar and chucking types
No. 2A, 3A Warner & Swasey Universal, chucking, Timken
No. 2B Foster Universal, m.d., chucking
No. 2F Foster Fastermatic, m.d., Timken
No. 2F Gisholt Fastermatic, m.d., latest type
No. 2G Morey, bar, m.d., latest

No. 2L Gisholt, m.d., chucking, standard and long bed types, Timken
No. 2L Gisholt, m.d., bar and chucking, latest
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 3 Gisholt Ram Type Universal, m.d., Timken, late
No. 3L Gisholt, m.d., chucking, Timken
No. 3L Gisholt, with cross sliding turret
No. 3 Warner & Swasey Universal, m.d., bar, latest
No. 3 Warner & Swasey Universal, m.d., chucking, latest
No. 3A Warner & Swasey Universal, m.d., chucking, latest

No. 4 FU Foster Fastermatic, m.d., latest
No. 5.0 Acme Universal, m.d., designed for glass bottle work, latest
No. 5 Bardons & Oliver, Universal Ram Type, m.d., chucking, pre-selector head, latest
No. 5 Foster Universal Geared Head, m.d., chucking
No. 5 Gisholt Ram Type Universal, pre-selector head, m.d., Timken, latest
No. 5 Warner & Swasey Universal, m.d., bar and chucking
No. 5 Warner & Swasey m.d., bar, pre-selector head, latest
6.2 Denver Turret Lathe, m.d. in leg
No. 7 Bardons & Oliver Universal, m.d., chucking, late
No. 7 Bardons & Oliver, cone
2½" Jones & Lamson Universal Saddle Type, m.d., bar, latest
2½x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
3¼" Cincinnati Acme Geared Head Flat Turret, chucking and bar types
18" Libby Type A, m.d., chucking
24", 28" Gisholt, cone
26" Libby Type C, m.d., chucking
#5 Woods Tilted Turret Lathe, Model D, cone



No. 1A WARNER & SWASEY TURRET LATHE

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Visitors welcome at all times.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

UNUSUAL VALUES

Milling Machines—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 5—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 10"x36" Surface 12"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 3', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 12" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 Columbus 16, Ohio

SIMMONS NEWS

ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORPORATION • MAIN OFFICE AND PLANT 1758 N. BROADWAY, ALBANY, N. Y.

SIMMONS BEST BUY

NEW — 22-B SIMMONS BACK GEARED MICRO-SPEED TURRET LATHE, with anti-friction bearings, 3 HP, AC 3 phase motor in base. Capacity, 1¼" round, 14" swing over bed power feed to turret. Hand longitudinal feed to cross slide.

SPECIFICATIONS:—

Round Bar capacity	1¼"
Hexagon Bar capacity	1-1/16"
Will turn, one setting	6"
Swing over bed	14"
Swing over cross slide	6"
Spindle speed range, RPM	44 to 750
Spindle nose threaded	2⅜" — 8"
Cross travel—5", longitudinal	12"
Hexagon turret hole diameter	1"
Power feeds	.006, .010 and .018
Spindle nose to turret face	18"

EQUIPMENT:—Automatic chuck and bar feed, stock stand, cut-off tool post with longitudinal hand feed to cross slide, pump and piping, 1¼" round collet, spindle brake, chip pan, motor and reversing type magnetic controller with push button station.

Net weight, approx. (lbs.)	2,975
Boxed wgt., approx. (lbs.)	3,650
C. C., approx. (c. f.)	145
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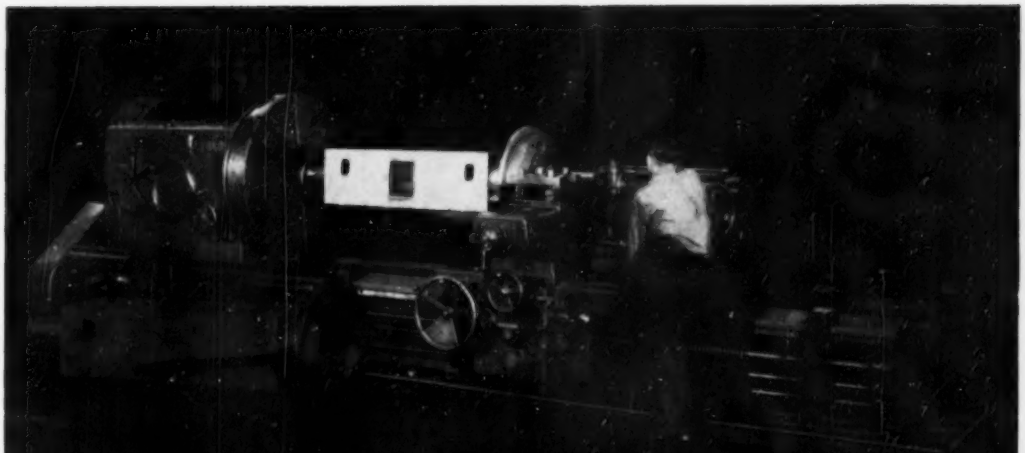

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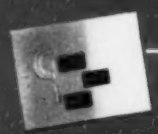

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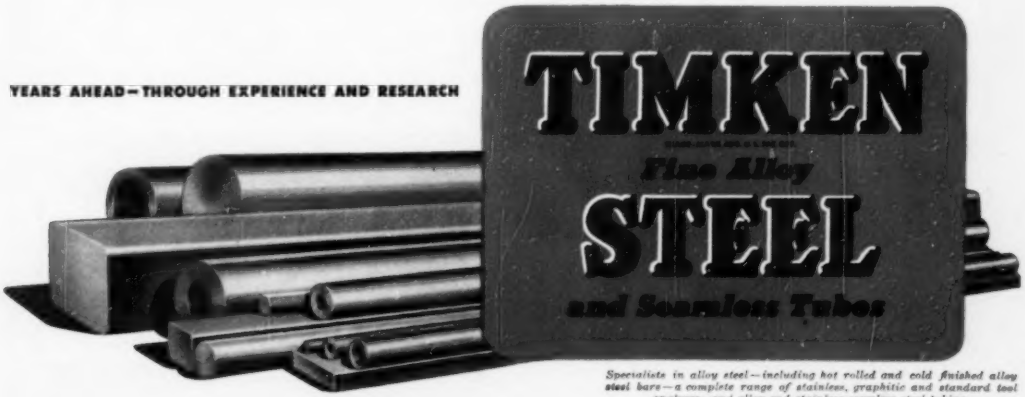

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